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EDITED BY
THE STAFF OF THE ROYAL NAVAL MEDICAL SCHOOL
ALVERSTOKE HAMPSHIRE

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Editorial

ON Saturday the 17th January 1961 Surgeon Vice Admiral Sir Alexander Ingleby-Mackenzie died His death, sudden and totally unexpected profoundly shocked and distressed his very many friends and former colleagues of the Royal Naval Medical Service

Alexander Ingleby-Mackenzie joined the Royal Navy on the 18th of December 1916 and apart from ten months of retirement during 1937–38 served continuously until 1956 having been Medical Director-General of the Royal Navy for the last four years of his career His knowledge and experience of the very numerous aspects of Naval Medical practice were quite extraordinarily comprehensive He saw active service in both World Wars he held specialist appointments in Medicine Hygiene and Ophthalmology; he served some fifteen years in ships, completed two commissions at the Royal Naval College Dartmouth served in R N Barracks the P and R T School Portsmouth R N Hospital Haslar and as his penultimate appointment, in R N Hospital Chatham as Medical Officer-in Charge in terms of width of experience of the Naval aspects of medical practice his career must have been quite unique

Physically short and of trim build Alexander Ingleby Mackenzie was an athlete who maintained a high degree of physical fitness throughout his life He played hockey for the Royal Navy in 1925–1928 and 1929 and in addition possessed outstanding ability as a tennis player In enumerating some of the qualities which carried this officer to the top of the Royal Naval Medical Service one must include his great energy zeal and enthusiasm for his work the deep personal interest which he took in all who served him and the unfailing helpfulness which he showed to the many who sought his aid and advice, he salted his advice and wisdom with a kindly humour

Perhaps it was in a social gathering that he appeared at his best his wit charm and immediate discernible liking for people won him great popularity admiration and affection As an after-dinner speaker he was outstanding

In a small Service such as the Medical Branch of the Royal Navy all members know each other well and we gain an intimate knowledge of the foibles the weaknesses and the strengths of each other As a member of a closely knit family a Naval Medical Officer whether or not he achieves pre-eminence in both his career and in his retirement takes with him always the affection and regard of his colleagues and thus the Royal Naval Medical Service grieves the passing of Sir Alexander Ingleby-Mackenzie and extends its sympathy to his widow sons and daughter

R L G P writes

"I was greatly shocked and grieved to learn of the sudden death of Alec Mackenzie I had known him for many years and had always felt that he raised the prestige of the R N Medical Service wherever he went He was a man of most attractive and friendly personality filled with zeal energy and enthusiasm for all his Naval duties and pastimes His aim always was that the Medical Branch should be as smart and effective as any other Branch of the Royal Navy and he set the superb example

"He joined the R N Hospital Plymouth as Medical Specialist in 1935 He hadn t been in hospitals for some years and was consequently a little rusty in hospital practice However he soon made up for lost time and fulfilled his duties with typical conscientiousness and fervour I was Pathologist there at the time and I was very impressed with his desire to learn as much as he could and do everything practicable for his patients He brightened our lives with his sense of humour and the stimulating way he tackled all problems He was always willing to assist anyone by his sound advice and good judgment

In 1949 he became Surgeon Rear Admiral and Medical Officer in Charge of the Royal Naval Hospital Chatham I was also serving there at the time and it was not long before his magnetic personality made itself felt for the benefit of the patients staff and all concerned He invigorated us all and made us feel that we were doing something of the greatest importance. He left that hospital a happy and efficient one

He became Medical Director General in 1952 He had never served at the Admiralty before and I was interested to see how quickly he would adapt himself to an entirely new environment He did it splendidly and he took all the problems and perplexities in his usual refreshing stride His personal interest in all Medical Officers Wardmasters and Nursing Officers and the scrupulousness with which he considered their future made a deep impression on me. I do not think that people fully realized the trouble and thought he gave to all the various individual difficulties which are bound to arise from time to time He always devotedly and diligently attended all prominent meetings St John s and Red Cross functions and suchlike which greatly added to the reputation of the Medical Branch as a whole He was well liked by all in the Medical Department from the most senior Naval Medical Officer and Civil Servant to the most junior of each Service He was so friendly and approachable to all in perplexity about their work or their play He worked very very hard at the Admiralty and seldom took leave He used to tell me that he got sufficient relaxation and inspiration by watching tennis at Wimbledon and the odd cricket match during the summer That was typical of his spirit of service and endurance Another feature of his character was that he never went sick He not infrequently suffered from heavy colds and allied conditions but he would never give in On several occasions he should have been in bed instead of sitting in his chair in the Medical Department On one occasion I remonstrated rather strongly with him on this matter and he replied Well you do the very same yourself Johnnie You seldom go sick either and I have seen you look ghastly at times We then both confessed that we had no use for people who went sick readily and quickly with minor disorders of little importance I had the honour of serving as his Deputy for his last six months of service, and I am sure nobody regretted his retiring from the Navy more than I did

My deepest sympathy to Lady Violetta and his children

Articles

CLOSURE OF THE ROYAL NAVAL HOSPITAL, CHATHAM

BY

Surgeon Commander P B NICOL, R N

As part of the planned closure of Nore Command after a moving ceremony in the Chapel of St Luke, the Union Flag was hauled down for the last time in Royal Naval Hospital, Chatham on Sunday 15th January, 1961

The 'youngest' of the three Naval Hospitals at home, building was started on this establishment at about the turn of the century and completed in 1905 when it was opened by H M King Edward VII on 26th July It succeeded a smaller Royal Naval Hospital built in 1827 in what is now known as Melville Barracks which was found to be too small to cope with increasing numbers due to Fleet expansion, Melville Barracks until 1960 housed the last remaining unit of Royal Marines in the Medway area

Many Naval Medical Officers are already familiar with the Hospital—modern, almost revolutionary in its day, built on the 'pavilion' system linked by a spacious window-lined main corridor almost 1,000 feet long and lying in 39 acres of grounds which formed a green and pleasant oasis in a necessarily built-up crowded area Medical staff at the opening in 1905 consisted of 9 Medical Officers 1 Head Wardmaster 7 Nursing Sisters and about 70 Sick Berth Ratings In 1959 before the final run down began there were 17 Medical Officers 1 Dental Officer 6 Wardmaster Officers 30 Nursing Sisters 20 V A D.s and some 250 Sick Berth Staff From 1948 for some years the Hospital housed the Combined Services Thoracic Unit and remained the centre for chest surgery in the Navy until 1960 it was responsible for the entry and basic training of V A D members, W R N S B A s and later, from 1960, Queen Alexandra's Royal Naval Nursing Auxiliaries In connexion with the Q A R N N A S the hospital was honoured by a visit of inspection by H R H Princess Alexandra in 1960

The ceremony, held on a cold, blustery day, was attended by Commander-in Chief the Nore Admiral Sir Robin Durnford-Slater *K C B*, The Medical Director General of the Navy Surgeon Vice-Admiral W R S Panckridge, *C B*., who had previously been M O I C of the hospital the Member of Parliament for Gillingham, The Mayors of Chatham, Gillingham and Rochester, with their

Lord Clerks and Mace-Bearers and many other Civic and Service guests of [illegible] he'd given later In a short preliminary address from the Chancel Steps the church packed beyond capacity, the Medical Officer-in Charge Surgeon Rear Admiral W V Beach began by welcoming guests including m[illegible] many ex-staff and ex-patients who were present whom he knew [illegible] many miss the Royal Naval Hospital and its Chapel He went [illegible] Nevertheless despite the break in a long Naval tradition I feel that [illegible] sure must be viewed in its proper perspective and due allowance made [illegible] the influence caused by the now fashionable but inevitable wind of change [illegible] Nore Command and with it this Hospital may well feel that the wind has [illegible] fed the force of a tornado

"And now our Hospital is closing and the patients are being transferred [illegible] but after an indeterminate period, the new hospital will reopen in [illegible] service of the local community including those Naval survivors of the storm [illegible] have sought refuge in H M S *Pembroke* Having once before under simi[illegible] circumstances closed a Naval Hospital and having re visited it when it had [illegible] as a Civil Hospital I am much less disturbed by this closure than I [illegible] otherwise have been For it is indeed only a suspension of the work of healing and in due course this will be resumed albeit under new management Meanwhile having seen the plans for the new Hospital I have great hopes for its future

The Service conducted by the hospital chaplain the Reverend W Harkness Browne M A R N then began Lessons were read by the Commander-in-Chief and Medical Director General respectively and the Address was given by the Chaplain of the Fleet the Ven John Armstrong *O B E* Q H C

The chapel organ was supplemented for the Service by the Orchestra of the Royal Marine Band of C in C Nore under the direction of Lieutenant T C Merrett L R A M R M

Following the Church Service, positions were taken up for the actual ceremony of hauling down the Union Flag The Receiving Room forecourt at the Main Gate was flanked on 3 sides by ranks of Officers Sick Berth Staff Queen Alexandra's Royal Naval Nursing Service and Naval Nursing Auxiliaries adjoining balconies and approach roads were thronged by spectators Senior Officers of the Services Mayors of the three towns with their town-clerks and mace-bearers made their way in procession from the Chapel to the Main Gate After a short march and counter march in slow and quick time by the Royal Marine Band the Commander-in Chief Medical Director-General, and the Medical Officer-in Charge took up their positions in the centre of the forecourt "Rule Britannia" was played after which the Parade Officer Wardmaster Lieutenant-Commander W James requested permission of the Medical Officer-in Charge to "Haul down the Union Flag" Commander in Chief's approval having been obtained the Flag was slowly struck to the moving music of the "Ceremonial Sunset" preceded by "Auld Lang Syne"

So a chapter in the history of the Royal Naval Medical Service was sadly closed The "wind of change" had passed by leaving in its wake the prospect

[illegible] modern hospital but taking with it the thoughts of many who had hoped to serve again in the friendly atmosphere always associated with The Royal Naval Hospital Chatham"

The following Officers Guests and their Ladies were present at the Ceremony

Admiral Sir Robin Durnford Slater *K C B* Commander in Chief The Nore
Surgeon Vice-Admiral W R S Pancknidge *C B* Q H P Medical Director General of the Navy
Rear Admiral J Y Thompson *C B* Admiral Superintendent H M Dockyard Chatham
Commodore L W L Argles *D S C* Commodore R N Barracks Chatham
Brigadier E F Parker *O B E* Commandant School of Military Engineering.
Miss H Moore *C B E* Q H N S *R R C* Matron-in-Chief Q A R N N S
Alderman J S Thomas The Mayor of Chatham
Mr Rowland Newnes Town Clerk of Chatham
Alderman G T Hamilton J P Mayor of Gillingham
Mr Frank Hill Town Clerk of Gillingham
Councillor I J Phillips J P Mayor of Rochester
Mr P H Bartlett Town Clerk of Rochester
F A Burden Esq Member of Parliament for Gillingham
Captain F H Thomas *M B E* F C I S R N Secretary to Commander-in-Chief
Lieutenant A R Lynch R N Flag Lieutenant
Captain B J Anderson *C B E* R N Chief of Staff
Captain A. Lade *O B E* R N Chief Staff Officer (Administration)
Instructor Captain R G Cross B A R N Command Instructor Officer
Chief Officer M I Talbot B A W R N S Staff W R N S Officer
Captain T T Brandreth M I Mar E. R N Command Engineer Officer
Captain C C Snither R N Captain of Dockyard
Captain W A. Haynes *O B E* R N Personnel Manager H M Dockyard Chatham
Surgeon Captain W B Taylor L R C P L R C S L D S Principal Medical Officer Depot Royal Marines Deal
Surgeon Captain L G Yendoll L M S S A R N Principal Medical Officer H M S *Ganges*
Surgeon Captain B S Lewis *D S C* M R C S L R C P R N Principal Medical Officer Royal Naval Barracks Chatham
Medical and Dental Officers H M S *Pembroke* (5)
Surgeon Commander W H E McKee M B B Ch D P H R N Senior Medical Officer H M Dockyard Chatham
Surgeon Rear Admiral R W Mussen *C B C B E*
Surgeon Rear-Admiral R L G Proctor *C B*
J H Siddons Esq. Superintendent Navy Works
Surgeon Commander E. C Jenet L D S R N Command Dental Officer
R C Hurst Esq Secretary to Admiral Superintendent
Commander G K M de la Fasinie R N. Staff Officer Operations
Lieutenant Commander B S Mallory R N Secretary to Chief of Staff
Surgeon Commander J W Walker *O B E* M B Ch B R N Representative of Surgeon Rear-Admiral R N Hospital Haslar
Armstrong John *O B E* Q H C Th L Chaplain of the Fleet

A CONCISE TREATISE ON MARINE SCIENCE

BY

Surgeon Commander JOEL GLASS R N.

Notes on a Study of the Surface and Deep Sea Waters

Introduction

An effort has been made to dissect this vast and intricate subject into chapter headings and arbitrarily four were selected to contain the material The defined headings have very liberal borders as each facet has a bearing on all the others Some repetition will take place particularly where there is blending of functional links

The present geophysical state is the product of millions of years of the earth's devolutionary progress and at this juncture a relative physically stable phase of an otherwise turbulent world is described oceanographically

The further purpose of this essay is to outline the ecological aspects related to the sea that are behind the events that have and do and possibly will continue to occur

We observe then, that the chemical study of the sea is related to topography and thereby to zonal sea life to physics of the sea and thereby chemical food chains and species balance Moulded into this complexity is the influence of winds tides and currents in the shallow and deep waters

Some reflections are noted in response to a multitude of questions arising from the study of these conjoint features into the springs of the sea

Chapter I—The Seas—Geophysical Aspects and the Beginning of Sea Life

One characteristic of the earth is the sea and since the sea was on this planet from the earliest time and long long before man appeared in his earliest form and dominated the surface area of the earth it is deserved of suitable respect as the remarkable compound to which all life is responsible and dependent

At present over two thirds of the surface of the earth is covered by oceans seas lakes or rivers A recent calculation notes the proportion of water to land to be about 2 4 to 1

Ommanney (1955) notes that the waters of the world are at present estimated to cover an area of 140 million square miles of the earth s surface and to occupy a volume of 324 million cubic miles However at one time the ocean waters

were everywhere Marine fossils are dislodged every now and again by Himalayan climbers some have been collected 25 000 feet from Mount Everest Sea bottom and coastal investigations also reveal that in the past it was missing from regions where it is now widespread (Smith 1939)

This is an age of rising seas The Geodetic survey of the east coast of the United States started in 1930 and in 1948 showed a sea rise of four inches This rise excludes storms and tides and represents a steady advance of the sea upon the land This is no new feature Ocean waters have covered much of North America several times and returned to their usual basins

Probably the greatest submergence took place in Cretaceous period—100 million years ago when about half of North America was submerged The British Isles were visible as scattered outcroppings of ancient rocks The Sahara Desert was formed by the wearing down of the sandstone deposits when the waters left Africa An inland sea covered the Russias and lapped at the heights of the Himalayas over 20 000 feet This story with variations was repeated when the ancient Ordovician seas of 450 million years ago rose and yet again in the marine invasions of the Devonian and Silurian eras The protozoan nummulites of the sea laid down the basis of the limestone deposits and in the early beginnings of our own civilized era the ancient peoples carved this stone to erect their monuments and pyramids to tell the story of their own days on earth The cliffs of Dover were formed in the Cretaceous period from the shells of formimifera cemented together with deposits of calcium carbonate It was during this period as well that the tropical currents of the shallow seas permitted tropical plant life to flourish in Greenland

Carson (1956) quotes the geologist Schuchert who postulated that at the present geological state a new cycle is beginning and that the Continents are at their largest phase highest and scenically grandest The oceans have begun another rising invasion They are again over-full and spilling over the basin rims The reason is a combination of causes The earth's crust is elastic and the movement cycle takes millions of years to complete With a movement downward the sea invades the lower Continental margins On the other hand the weathering down of the land with loss of substance into the sea has a tendency to cause the land to rise higher Whilst this last influence is operating the sediment making its way to the ocean floor causes it to sag under the increasing load and increases the depth of the basin Thus the workout of a rising sea level is highly complex and includes a large Continental mass shift—slow as it may be and the growth of vast submarine volcanic chains—i e Bermuda being a small one and the Hawaiian chain a large one These chains arose in the Cretaceous period when the greatest flood advanced on the existing Continents —before any legendary personalities in arks existed

In our time the part the glaciers play on the land masses and the sea level is one of the principal factors We are at present in the position of the last phases of the Fourth Glacial Decline In the Pleistocene era, there were formations and declines of great ice collections These formations occurred as stated four times and covered a tremendous land area The last Pleistocene glaciers remain

now as the large ice caps north of Greenland Antarctica, and the isolated glaciers of the high mountains

An estimation has been made that there is enough water frozen in the Arctic and Antarctic regions which on release would cause the Atlantic to rise about 100 feet Dr Boeker the singularly imaginative scientist of John Wyndham's novel The Kraken Wakes ' rejected this round figure calculation and conjectured that at best this water if released would "raise" the world's oceanic level

The sea level at the North Pole is about 50 feet higher than the mean sea level and at the South Pole about 50 feet lower With huge water masses thus dispersed the earth's shape should have a top heavy bulge and a narrower lower curved base—and should in fact look like a duck egg or be pear shaped

The glacial influence during their expansion meant the lowering of the ocean level as moisture was withdrawn without return as rain or melting snow As the summers were short and cold and the winters longer and colder still more snow and ice was formed than that melted

Under such conditions at one of the lowerings of sea level, the North Sea area became dry land and the River Seine as a drainage channel cut a trough across the Continental shelf and later became the English Channel

The last glaciation was in our period 200 000 years ago and the sea lowering was seen by paleolithic man who found he could walk across the Bering Strait from Siberia to Alaska or cross "Adam's Bridge' from India to Ceylon As these people lived primarily on the sea shore of that day, meagre remains of their early life are seldom found How far the oceans receded into their own basins is not actually known It will be marked out one day and another mystery of our past will be explored in an attempt to predict the character of the changing face of the earth in a slowly changing world The vast sea has a lot to do with events that occur on land This water world our hydrosphere rests on the lithosphere foundation which itself extends some 50–75 miles deeply into the earth's interior to the core the centrosphere a vast mass when related to the earth's diameter of 7,918 miles (Ommanney 1955)

These deep basins which the oceans occupy are of great age, and no part of the ocean floor has been raised above the surface since first organic oozes began to fall and accumulate upon it This is important for it is the key that covers practically the whole period when life was first evolved on this planet and nowhere on the surface of earth are there substances which resemble in composition the organic oozes which cover the ocean floor

Whence came this water to collect and cover the basins they occupy? Early theories alleged it was from the gases surrounding and enclosing the hot primitive earth which contained a high proportion of water vapour carbon monoxide and carbon dioxide but without oxygen It was not yet the "atmosphere" which we now breathe Water vapour rose from the primeval rock containing it and the dense thunderous blanket clouds released water as torrential rain which evaporated on contact with the hot rocks Then, as the earth body cooled, the rain began to settle in the crust basins and the first, warm oceans were born

As the rocks cooled and solidified the water vapour in solution in them was expelled as well as the water chemically bound in sinanum which is still being released

Petterson (1954) refers to Rubey who in 1951 wrote in his Geologic History of Sea Water that in his opinion the oceanic waters were derived mainly from the earth's crust rather than the assumed mass condensation of water vapour of the dense ancient atmosphere Rubey's definition of quick soaks" describes one school of thought which infers the waters present at the birth stages of earth and the other group the slow soaks theoreticians consider the oceans were increased by small increments over a much longer geological period This latter group alleged that the excess volatiles were gradually released from the earth's crust and were contained in the interior in quantities amounting to a fraction of 1 per cent of the total weight of solid matter

Rubey calculated from geochemical studies that the total quantity of water in the primitive atmosphere and ocean was not more than one-sixteenth of the present total and that the rest was a slow release from the crust during crystallization of the molten complex silicates This release of magmatic or juvenile water through hot springs (as matter which did not participate in supra crustal cycles) so termed by Wegmann is highly feasible Existing hot springs bring to the surface approximately 0·8 per cent of juvenile water and could in 2 000 million years account for the entire volume of present oceanic waters

Revelle of the Scripps Institution of Oceanography propounded the theory of ocean origin which centres on the release of a large part of the magmatic volatiles (water vapour carbon dioxide and mineral acids) from the ocean floor itself through the aforementioned process of recrystallization of the underlying substratum It was hypothesized that in the past 100 million years a water layer over 3·000 feet deep has been produced in this manner Thus release has also caused the ocean floor to sink so that the water level has not greatly changed This subsidence of the ocean floor could be the reason for the gradual sinking of volcanic islands and the explanation of the depth of the 'guyots' the flat-topped volcanic cones with wave planed summits lying at depths of 2 500–6 000 feet below the surface of the Pacific

If protagonists of the slow soaks' theory are correct then it is inferred that a continual release of crustal water will take place for many years in the future With this activity a reverse action of water entering the earth's crust is also a possibility so that the shape of the ocean floor is not likely to remain static As expected where rocks of deep crust origin have been forced above the surface the many oceanic islands the composition is that ascribed to 'sima' Deep dredger samples too have produced similar fragmentary rock of basaltic nature

The rocks which form the three principal types making up the earth's surface layer are

(1) *Igneous Rocks*—which came from the depths in a molten state and then solidified as large, coarsely crystalline bodies in the process of rising to the surface emerged as lava from volcanoes or became revealed later by erosion

The age of this rock is determined by the time when crystallization of the minerals formine the rock took place

(2) *Sedimentary Rocks*—were usually laid down in the sea and were derived by erosion of pre-existing land masses These rocks can be dated by the minerals which formed at the time of sedimentation and extracted from them

(3) *Metamorphic Rocks*—were originally igneous or sedimentary and they became reconstituted and chemically changed by heat and pressure during tectonic volcanic activity

The oldest known rocks on earth are aged about 3,100 million years and the search for older rocks still continues Some meteorites examined by modern analytical means are stated to be 4 600 million years old and it is generally assumed that they were formed at the same time as earth and other planets

Wager and Moorbath (1960) note that geochronological measurements made on these three types of rock show with great precision that the oldest rocks are over 3 000 million years old and that young rocks were formed about half a million years ago

Methods of Rock Age Determinations

Rutherford in 1906 was in favour of using natural radioactivity as a means of probing mineral age The basis was a calculation of lead as the end prodnct of uranium and thorium which followed a characteristic rate of radioactive decay within a closed system of parent and daughter isotopes An acenrate time scale was devised by Holmes by use of this method The limitation was the type of rock which was lead bearing

Nier in 1938 developed the method of mass spectrometry and measured quantitatively the ratios of abundance of individual isotopes constituting a chemical element

Three recent methods of analytical technique have been found successful in determinations for the commonly occurring rock-forming minerals

(1) The potassium-argon method is applicable over a wide range of geological time and particularly useful for the silicate mineral rocks of the mica type

(2) The most recent method is the rubidium strontium technique which depends on the measurement of decay of isotope rubidium-87 to strontium-87

(3) The more widely known method is the Carbon-14 system which differs in principle from the other two Carbon 14 is produced by cosmic ray reactions in the upper atmosphere and enters earth's atmosphere as carbon dioxide whence it becomes incorporated in plant and animal tissues Its radioactive half-life decay is 5,570 years

This method can go back only to 70,000 years ago and thus very recent geological changes mainly of sea level character and of ice age aspects are possible by measurement of the actual radioactivity of the specimens concerned and not the amount of radiation of the daughter element as in other methods

The common ancestors of plants and animals rose in the surface waters of the sea a thousand million years ago Fossil records are confusing beyond the

Cambrian period, some 600 million years ago so that the first 400 million years of the evolution process remains unknown to us By the Cambrian period many groups of invertebrates had appeared and were all marine There was then, perhaps no vertebrates—and the marine ancestors of vertebrates as small, soft-bodied creatures left no fossils behind for us to probe

It is presumed at the end of this period the vertebrates began to colonize fresh water and then evolved in rapid stages (Colman 1950)

In the Ordovician period—about 440 to 500 million years ago—the first vertebrates *per se* appeared and from geological deposits were fresh water creatures and some of their descendants have remained in fresh water ever since known today as the lung fishes of Australia Africa and South America.

In the Carboniferous period the first marine fish appeared and from them descended the vast majority of present-day fish—the cartilaginous or bony

This boundary between sea and fresh water has been crossed many times in the passage of time i e from sea to fresh water in the Cambrian and Ordovician periods and from fresh water to sea water in the Carboniferous period—since then back to fresh water perhaps more than once in later eras

The vertebrates descended from ancestors which migrated to fresh water from the sea some hundreds of millions of years ago and did so when the salinity of the sea was much less than it is at present In man and other vertebrates the blood plasma contains the same chemicals as the sea in much the same proportions to each other but at less than approximately half-strength Life originating on the surface of the sea then about a thousand million years ago could not have done so in anything but the form it did unless the sea water became a diluted solution of diverse salts and was at the right temperature

The protoplasm of man only lives when bathed in an internal environment of blood plasma and lymph which has remained for all these number of years to all intents and purposes the same as the external environment of our remote marine forebears

This inheritance from the many hundreds of millions of years ago when that remote many-celled predecessor developed a circulatory system in which the fluid was sea water altered but little through the changing forms of invertebrate to vertebrate from the cartilaginous to skeletal forms and continued through development in evolutionary embryonic stages to the present day when all human newly born pass through the developmentary stages by which the race evolved in a watery world to land creatures conceived still in the miniature ocean of the mother's generic organ When this being of arboreal existence matures and his superior brain evaluates the forces of this planet he eventually is directed back to the sea and knows that his sphere is a water world

A dominant feature then is this covering mantle of ocean and the landed areas even the highest points being mere roots of former tall land masses slowly diminishing worn away by the all embracing sea It all happened before in the Palaeozoic and Mesozoic eras and in the present Caenozoic era as well which is a mere 70 million year span

The sea mountains are infinitely older than the Continental land ranges The sea-mountains of the central Pacific which still exist were formed before the Cambrian period and correspond to Continental mountains formed in the Laurentian upheaval Nothing is left of these peaks on land which were of towering supra Alpine heights These pacific mountains were old when 200 million years later the Appalachians wore down and they were so much older, 60 million years later when the Andes Rockies and Himalayas rose (Carson, 1956)

(*To be continued*)

EAR INJURIES IN DIVERS

BY

Surgeon Lieutenant A S JARRETT R N

FOR some years now the high failure rate in the training of shallow water divers has been a matter of concern for the Fleet is still short of men with this qualification Every effort has been made to encourage volunteers who are first examined for medical fitness in their own ships and then drafted to one of the Royal Naval Instructional Diving Establishments for the three-week course During 1959 in H M S *Vernon* 274 officers and men with no previous diving experience started shallow water diving courses 78 qualified 109 left course at their own or their instructor s request and 87 were recorded as having "failed medically unfit"—an overall medical failure rate of 32 per cent which in men who have been passed as medically fit is surely excessive

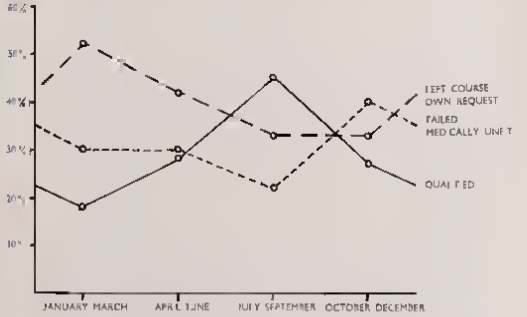

FIG 1.—The seasonal variation in the success rate of shallow water divers trained in H M S *Vernon* during 1959

The records for 1959 do not give any details of this medical unfitness, so during the Autumn term of 1960 in H M S *Vernon* a complete medical record of every shallow water diver was kept throughout his course in the hope of finding the causes of so much medical unfitness, and, if possible, reducing its incidence. It was found that medical failures among divers fell into four main groups: (I) due to badly designed equipment (reversed ear); (II) due to faulty technique (inadequate ear clearing); (III) due to infections (e.g. common colds), (IV) those men initially unfit for diving. There are no figures to compare the incidence of each of these groups with that in 1959, but the overall morbidity rates show a distinct improvement.

Because there is a marked seasonal variation (fig. 1) the results for the Autumn term 1960 are compared with those for the same term of 1959 and tabulated in Table I.

TABLE I—NUMBERS OF SHALLOW WATER DIVERS QUALIFYING IN H M S *Vernon* IN THE AUTUMN TERMS OF 1959 AND 1960

	1959	1960
No. qualifying	32 (30%)	82 (64%)
No. medically unfit	41 (38%)	14 (11%)
No. leaving course at own request	35 (32%)	32 (25%)
Total	108	128

I. REVERSED EAR

Reversed ear occurs only in divers wearing an impervious helmet or hood over the head. For reasons which will appear later the injury is exceptionally rare in helmet divers and at the present time is practically confined to divers wearing a C type hood, a balaclava-like garment of rubber with an exhaust valve at the nape. During the Autumn term 14 cases of reversed ear were seen, of which 10 occurred in experienced divers taking clearance diving courses. This again suggests that reversed ear might not be due to faulty technique, and closer examination of the condition reveals that it is almost certainly caused by the equipment used.

There are no symptoms of reversed ear. In some cases the diver will remember some temporary difficulty in clearing his ears on descent but this is so common in all divers that it cannot be specifically related to reversed ear, and 9 of the 14 cases had no pain or difficulty of any kind. The gross sign of reversed ear is blood on the external ear, but lesser signs may coexist with this or be found in its absence. Twenty volume hydrogen peroxide is useful for clearing blood and debris from the ear and making a detailed examination possible, and was incidentally found to reduce the average recovery time from fourteen days (4 cases, mean deviation three days) to six days (9 cases, mean deviation 1·6 days). When the ear has been cleared one or more of three abnormalities may be seen. There may be subcutaneous petechiae in the

meatus or these may have progressed to blood-filled subcutaneous blisters which may be large enough to fill most of the lumen (fig 2)

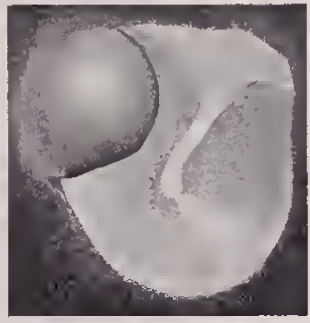

Fig 2 A subcutaneous bulla arising from the postero superior part of the bony portion of the right external meatus

If blood has appeared on the outer ear one such blister is oozing or has burst and in this case ragged curtains of torn skin are seen surrounding a bleeding area devoid of skin In those cases with petechiæ only or in which the blisters have burst there is an unobstructed view of the drumhead and in no case was any abnormality seen—it was always intact and freely mobile both by Valsalva manœuvre and Siegle insufflation Injection along the handle of the mallens is seen in almost every man undergoing his first diving course and was not considered a significant finding in cases of reversed ear In only one case was the drum involved—a hæmorrhagic blister arising from the postero inferior part of the bony canal had extended medially the blood lifting the skin from the periosteum and eventually extending between the cutaneous and fibrous layers of the drum in its postero inferior sixth The rest of the drum was normal and indeed the whole tympanic membrane moved with the Valsalva manœuvre though the diver said he felt his ear was not clearing properly In three other cases divers said that their affected ears would not clear but irrigating the meatus with hydrogen peroxide abolished this sensation which was presumably due to debris resting on the drumhead

Reversed ear got its name from the assumption that the drum bulged outward and eventually ruptured if the pressure in the middle ear exceeded that

in the external ear (Cousteau 1953) If this were so then an identical form of injury would be seen after over-enthusiastic Valsalva manœuvres in which an excess pressure of 450 mm Hg may be produced (Buchthal 1959) which represents a greater pressure than that of 15 feet of water above which depth four cases of reversed ear occurred In fact it is unknown for the Valsalva manœuvre to injure the normal ear (Mr John F Simpson, personal communication) and it is very difficult to see how external bulging of the drum could cause haemorrhagic blisters *in the wall of the meatus* and leave the drum itself normal A pressure difference across the drum must be rejected as a cause of reversed ear and a second possibility considered—an external meatal pressure below *ambient*, i e the pressure surrounding the body as a whole Now if the diver has been clearing his ears properly the middle-ear pressure will be at ambient and should the meatal pressure be for any reason lower than this the drum will indeed bulge outward but we have already seen that this is a harmless event However, an increased ambient pressure has an effect which is often overlooked As the body is immersed in water the blood pressure is increased by the pressure of the water by direct fluid transmission Of course the diastolic/systolic difference remains the same and as the tissue fluid pressure is also increased by the ambient pressure the peripheral resistance and the work of the heart remain almost unchanged—they are in fact slightly lowered due to the reduced head of hydrostatic pressure within the vascular system If, however the pressure in the external meatus is below ambient this pressure difference will passively dilate the blood vessels in the skin of the meatus The skin in this situation is closely attached to the periosteum of the bony canal and there is very little elastic subcutaneous tissue in which the vessels of the rete arteriosum cutaneum can expand If they do so the skin will be split from the periosteum forming first petechiæ and then bullæ which is precisely the damage seen in reversed ear

A meatal pressure below ambient could account for all the signs seen in reversed ear and anyone who has ever dived in a rubber suit and C-type hood knows that the pressure inside such a suit after diving is most definitely below ambient—invariably the first action after leaving the water is to pull the hood away from the face which lets a rush of air into the suit The following case illustrates that this reduced pressure within the suit seems capable of producing reversed ear injury without postulating the formation of rubber/skin seals over the ears A Petty Officer reported with blood on the left ear and examination revealed a ruptured subcutaneous bulla on the floor of the left meatus the right ear was normal He was told not to dive and to report again in one week's time. He interpreted this literally and spent the week surface swimming in rubber suit and C-type hood This produces a negative pressure within the suit just as submerging does and when seen again there was a bulla arising from postero-superior part of the *right* meatus filling two-thirds of the lumen As the head had never been submerged there is no question of increased external pressure forming seals around the ear

Reversed ear signs can be adequately explained on the basis of an external meatal pressure below ambient, and it is a commonplace that such a reduced

pressure occurs in the rubber suit with C type hood It remains to explain why this reduced pressure occurs in this equipment The rubber suit is a one piece garment and is entered through the neck The C type hood is pulled over the head and clamped to the suit by metal neck rings It forms a water-tight seal round the face and has an exhaust valve at the nape When the suit is put on it contains air at atmospheric pressure but the increasing pressure on descent squeezes more and more of this out through the exhaust valve and the suit is compressed The elasticity of the rubber tending to restore the suit to its original uncompressed position gives rise to the lowered internal pressure The meatal pressure could be lowered even further relative to ambient if the hood formed a non-elastic seal over the ear while the diver continued to descend Evidence that this can happen was seen in one case in which there was a ruptured hæmorrhage bulla in the left meatal wall with a normal left drum while the right meatus was normal but the right drum severely indrawn and injected due to temporary Eustachian block on that side

Reversed ear could be prevented by rejecting this type of hood A neck seal could be worn in its place and the suit vented through the cuffs, there would still be a reduced pressure within it but it would not be communicated to the ears A porous free flood hood would provide warmth and ensure that the meati were always at ambient pressure In waters where ear infection is a danger the C type hood could be worn with some device which connected the air-supply (always at ambient) to the ears e g a lump of sponge rubber Suit inflation is not a complete answer to reversed ear danger While working at depth the suit-inflation gas is constantly being massaged out through the exhaust valve and the suit has to be reinflated at intervals which may be as short as 5 minutes Towards the end of each such interval the normal risk obtains and one case of reversed ear occurred in just these circumstances

While reversed ear injuries continue to be seen the treatment involves the stopping of diving to prevent further damage, and the avoidance of infection This means no local treatment except hydrogen peroxide and prophylactic sulphadimidine for five days The differential diagnosis from ruptured eardrum is important for the latter is due to faulty ear-clearing, which must be investigated, and the prognosis of ruptured ear drum is worse if only in that the man's future eligibility for diving is doubtful

II Inadequate Ear clearing Technique

Nineteen men arrived at *Vernon* unable to move their eardrums by the Valsalva manœuvre They were subdivided into two groups those whose drums did not move on Siegle insufflation (6) and those whose did (13) The former all had colds or incipient colds and were treated accordingly The latter had no apparent pathology and it was assumed that in the Valsalva manœuvre they were not blowing in the right place to open the Eustachian tubes They were allowed to go into the pressure pot but every one had to come out before the regulation simulated 40 feet had been reached The technique of ear-clearing was then explained to them in detail and they were accompanied by the Medical

Officer in 1 second pressure pot trial in which all but one completed the 40 foot run without trouble In explaining the technique it was found helpful to stress the following points (1) Blow into the nose not the mouth If the cheeks bulge effort is being wasted (2) If the pressure is being correctly applied the nostrils bulge out above the fingers pinching them and this can be done with the mouth open (3) Protruding the lower jaw as much as possible helps to open the Eustachian tubes

This suggests that before a negative Valsalva is taken to imply Eustachian blockage (B R 1750A (50) Para 100 (a)) a Siegle insufflation should be tried If this is positive there is a possibility that the man's technique not ears is at fault and this can usually be altered by instruction All auroscopes supplied for use by Royal Navy Medical Officers have attachments for Siegle insufflation if they were more widely used there might be more candidates for diving and fewer failures in the selection of aviators (Surg Capt Boyd-Martin R.N personal communication)

(II) Infections

During the Autumn term one of the total of 128 shallow water divers under training 18 reported to the Sick Bay with colds All were stopped diving and given mist aspirin 15 ml t d s- and nasist ephedrin ½ per cent t d s which was taken supine with the head dependent Fifteen had recovered within three days and continued their courses and qualified Three still had symptoms or signs after the maximal allowable time lost of three days and were taken off course

One outbreak of herpetic myringitis occurred The first case seen was in a trainee clearance diver who complained that his right ear had not been clearing properly for two days There was a blood-filled blister about 2 mm diameter in the centre of the right drum and a patch of herpes simplex round the left corner of the month All remaining 16 members of the class were immediately examined and a further 5 cases of herpetic myringitis discovered These were symptom-free, and in none of these cases had the blebs become hæmorrhagic All were stopped diving and given prophylactic sulphadimidine and those 5 with serous blebs had healed completely within four days and continued their course The original case showed very little improvement after seventeen days Serous blebs heal quite quickly but if they contain blood persist much longer and are obvious sites of weakness and potential perforations If the stresses of diving could cause hæmorrhage into a serous bleb which seems possible it is worth trying to pick up any cases of herpetic myringitis as early as possible

IV Initially Unfit for Diving

Eight men had to be rejected as medically unfit to dive on arrival one congenital defect of the lympanic membrane one deviated nasal septum with unilateral Eustachian blockage one myringitis due to cotton-wool plugging the meatus one chronic tonsillitis- one chronic sinusitis, and three acute colds Although they were never allowed to start a diving course they were officially recorded as medically failed on course since candidates are supposed to be medically fit before draft to *Vernon* (B R 1750A (50) Para 98 (b))

V Nose Bleeding

Three men complained of nose-bleeds while diving In each the bleeding was from Little's area and direct questioning revealed that the diver had been trying to clear a flooded face-mask by blowing into it past his nose-clip Each was told to clear his face-mask by blowing past his *mouthpiece* None was taken off diving, none had further trouble and each finished the course and qualified

Summary

(1) The common medical ailments causing failure on shallow water diving courses are described

(2) The medical failure rate has been reduced from 38 per cent to 11 per cent

(3) This last figure still contains 8 men medically unfit on arrival and 4 cases of reversed ear As both these conditions are preventable the medical failure rate could have been as low as 1 6 per cent

Acknowledgments

I am grateful to Surgeon-Commander R T May R N , Senior Specialist in E N T who confirmed the diagnoses to Surgeon Lieut -Commander D E Mackay for his constructive comments and to the staff of the Instructional Diving Section, H M S *Vernon* for making the records for 1959 available to me

References

Buchthal F (1959) *Quart J exp Physiol* 44 137
Cousteau J Y (1953) The Silent World Hamish Hamilton

RESIGNATION OF SIR JAMES PATERSON ROSS BT *A C V O* M S F R C S

We announce with regret the resignation of Sir James Paterson Ross as a Consultant in Surgery to the Royal Navy

In a letter dated 22nd November 1960 acknowledging the resignation of Sir James the Medical Director General stated

"I voice the sentiment of the Naval Medical Service when I state how sorry indeed we are that you feel obliged to resign your appointment

Please accept our best wishes on your new appointment as Director of the British Post Graduate Medical Federation and the thanks of the Royal Navy for the time and service you have given during these many years in your capacity as one of our Consultants. We all of us have been most appreciative of the interest you have shown and of the help you have given us in solving our problems and difficulties

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Reviews

SURGERY AND CLINICAL PATHOLOGY IN THE TROPICS By Charles Bowesman *O B E* B A M D F R C S F A C S D T M &H Ed Pp viii 1068 with 321 figures Edinburgh E & S Livingstone Price £5 10s 0d Home postage 2s 9d

It is always a pleasure to read a book which is the result of one man's long experience over a broad field. This is particularly so when it covers an aspect of surgery which has been somewhat neglected in the literature

Mr Bowesman has written this book as a result of his wide experience as a Medical Officer and a Surgical Specialist in the Colonial Medical Service. It is written not so much for the specialist as for the general medical officer who is asked to undertake all branches of the work and expected to do so with reasonable skill As Mr Bowesman points out the many excellent textbooks of surgery written concerning conditions as seen in temperate regions of the world appear to be peculiarly "out of focus" when applied to conditions as seen in the tropics Mr Bowesman also considers that many forms of treatment which are standard in temperate climates are quite impractical under tropical conditions and that many methods adopted in less advanced areas of the world, and which work well would be strongly disapproved in the higher academic centres of the northern hemisphere However it is important to note that the reason for some of the forms of treatment common in home hospitals being impractical under certain tropical conditions is not because the methods themselves are incapable of application but because the proper facilities are not available When such facilities are available in the tropics they can usually be used with advantage, particularly so in the regulation of fluid and electrolyte balance This book shows what can be done in difficult conditions and with few facilities but perhaps does not make sufficiently clear that when the facilities are there they should be used

With the needs of the Doctor in the Country Station in mind Mr Bowesman includes chapters on gynaecology obstetrics surgical conditions of the upper respiratory tract

surgical conditions of the eye and the effects of the bites of snakes and other noxious agents. Thus a full and broad field is covered.

The question of amoebic dysentery and its complications is well discussed. This disease is of some importance to Service Medical Officers. The reviewer well remembers seeing a 50-year old European cured of what had appeared to be a carcinoma of the transverse colon by a course of emetine and has recently seen in a home hospital a case of advanced amoebic hepatitis which only revealed itself many months after the patient had left the Far East.

There is also an article on sigmoidoscopy and its findings. The sigmoidoscope is one of the valuable instruments which enables one to look into the present and its importance, particularly in tropical conditions, merits the separate section devoted to it. Photographs or illustrations in colour would have enhanced the value of this section.

Chapters are included on schistosomiasis, helminthic infection and infections and ulcerations generally, which are useful and practical. There is also an article on the surgical aspects of typhoid fever—within the past two years the reviewer has seen a case of typhoid fever in an inoculated European sailor diagnosed at laparotomy for suspected appendicitis.

Mr Bowesman in his preface says of his book "If it gives the answer to even some of the difficult problems which constantly arise in country stations, it will have achieved its main object." I am sure that the book does this and more, but its value is as a supplement to, and not a substitute for, the many excellent textbooks of surgery written for temperate conditions. Mr Bowesman has done a service to practitioners in tropical places.

J W

The Pocket Prescriber and Guide to Prescription Writing. By Alistair G Cruikshank, F R C P E, Formerly lecturer on Materia Medica, University of Edinburgh. Seventeenth edition. Pp 307. Edinburgh: E & S Livingstone. Price 6s. Home Postage 5d.

This small pocket prescriber, less than 4 in × 3 in in size, is now appearing in its seventeenth edition since its introduction in 1882, and its seventh revision since the commencement of the last war. By itself this is sufficient testimony of its popularity, especially among the graduates of the Scottish Universities.

Approximately half the book is devoted to a list of suitable prescriptions for diseases arranged in accordance with the clinical systems of the body, with 40 pages of additional prescriptions selected from the latest edition of the British National Formulary 1960. The remaining pages of the book contain notes on modern proprietary remedies, broad spectrum antibiotics, posological tables, D D A regulations, etc., but without any suitable reference to the steroids.

In the writer's opinion, the medical practitioner has to choose between this booklet and the latest B N F, as there is obviously no real requirement for both of these excellent references with regard to modern therapy in medical practice.

L G T

A Primer of Medicine. By M H Pappworth, M D, M R C P. Pp 252. London: Butterworth & Co. Price 32s 6d, 2s postage.

Do not be misled by the simplicity of the title. The Oxford Dictionary describes a Primer as "a small introductory book".

This book is small by contemporary standards but is packed with valuable material. It is essentially clinical and in a way calls to mind an old and trusty favourite, Hutchison's and Hunter's (once Rainy's) Clinical Methods, but is less documented—is probably the best word—and more readable. Dr Pappworth sets the tone of his book in an introductory paragraph: "This book is based on my M R C P (London) course. Many students are surprisingly ignorant of what I consider to be essentials. Although they can prattle of diamond murmurs and lesser aortic clinks they cannot discuss sensibly an elementary valvular

[illegible] determining spike waves and [illegible] to determine the significance of column lesion. The pages which follow are crammed with facts but, though it is fashionable to decry factual knowledge in medicine, it is impossible to be a good clinician without possessing a large store of facts."

The book has no photographs, and of its 252 pages only 29 are given to the Alimentary system while 40 pages are devoted to Cranial Nerves—which may seem disproportionate, but these 40 pages describe beautifully the intricacies and involvements of this area which so many physicians find difficulty in visualizing and assessing.

The Cardiology section—but don't look for a dissertation on electrocardiography: it's not there—is also outstanding in its precise description of the clinical examination of a heart and its murmurs, but if one wants to be critical it seems surprising that Dr. Pappworth omits to mention the accredited and extremely effective method of augmenting in full expiration an elusive aortic diastolic bruit.

The author makes clear his intolerance of frills, both terminological and diagnostic, and stresses the paramount importance of "essential knowledge" and logical progress to a diagnosis. There are few doctors in these days of ever increasing complexity who will not enjoy and endorse the stricture "Especially in regard to hearing, suggestibility is a potent source of error and the experienced doctor can make the less experienced and uncritical hear anything that he wishes them to hear" . . . apparently with increasing years and even sometimes with increasing deafness some Cardiologists are hearing many more things than they could twenty years ago.

An unusual feature in a book of this sort is a chapter on "The diagnosis of obscure pyrexia".

The author deprecates eponyms in medicine, but many would feel it a pity to purposely avoid the names hallowed by usage. Let Graves, Horner, Weber, Plummer Vinson (or should it be Patterson Kelly) survive, and surely Koplik is entitled to his spot in the limelight ! —but these are unsubstantial criticisms: the book is a model of clarity and common sense, and can be recommended for all medical officers, particularly the physicians amongst them.

E. D. C.

We acknowledge with thanks receipt of the following publications:

Acta Medica et Biologica. Annali di Medicina Navale E Tropicale. Annales Medicinae Internae Fenniae. Australian Journal of Experimental Biology and Medical Science. Bechtuk Arpunnouolen N Beluyooohn. British Medical Bulletin. British Medical Journal. B.S.I. News. Fukushima Journal of Medical Science. Guy's Hospital Gazette. International Review of the Army, Navy and Air Force Medical Service. Journal of the Royal Naval Scientific Service. Kyushu Journal of Medical Science. Le Medecin de Reserve. Medical Journal of Osaka University. Middlesex Hospital Journal. Military Medicine. Mie Medical Journal. Montreal Medical. Nanfi Review. Nagoya Journal of Medical Science. Proceedings of the Staff Meetings of the Mayo Clinic. Revista Sanitara Militara. Sotilaslaakr—Tidskriften Aikakauslehti. St. Thomas's Hospital Gazette. St. Mary's Hospital Gazette. The British Journal of Surgery. The Bulletin of Tokyo Medical and Dental University. The Gunma Journal of Medical Sciences. The Journal of the Irish Medical Association. The Keio Journal of Medicine. The Medical Press. The Tohoku Journal of Experimental Medicine. Tropical Diseases Bulletin. University of Durham Medical Gazette. World Health Organization Chronicle. Yokohama Medical Bulletin.

News of the Service

OBITUARY

Surgeon Rear-Admiral A McCLOY died on the 10th August 1960 at the age of 82 years
He qualified M B B Surg Royal University of Ireland in 1901

Surgeon Rear-Admiral McCloy entered the Royal Navy as a Surgeon on 21st November 1902 He was promoted Surgeon Lieutenant-Commander on 21st November, 1910 Surgeon Commander on 21st November, 1916 and Surgeon Captain on 1st July 1927 He was placed on the Retired List (age) on 8th March 1933 and was promoted Surgeon Rear-Admiral (Rtd) on 3rd July, 1934

Surgeon Rear-Admiral T B SHAW died on 17th January 1961 He was born on 19th May 1879

He qualified M B—B Ch.. University of Edinburgh in 1901 and entered the Royal Navy as a Surgeon on 10th August 1901 Almost immediately he saw Active Service and took part in the Somaliland Campaign in 1904 He was promoted Staff Surgeon on 10th August 1909 Surgeon Commander on 10th August 1915 and Surgeon Captain on 1st July 1926

Admiral Shaw was placed on the Retired List (age) on 2nd July 1934 in the rank of Surgeon Rear-Admiral

On the 8th July 1926 Admiral Shaw received Their Lordships expression of his valuable services in connexion with the designing and perfecting of an air purifying apparatus for submarines

Surgeon Rear-Admiral E T MEAGHER died on 13th January 1961 at the age of 90 years He qualified M R C S Eng. L R C P Lond in 1891

Admiral Meagher entered the Royal Navy as a Surgeon on 15th November 1892 and was promoted Staff Surgeon on 15th November 1900 Surgeon Commander on 15th November 1906 and Surgeon Captain on 31st December, 1921 He was placed on the Retired List (age) on 11th April 1925 with the rank of Surgeon Rear-Admiral

Surgeon Captain J C BROWN died on the 3rd October 1960 He was born on 14th November 1888

He qualified M R C S L R C P University of Birmingham

Surgeon Captain Brown entered the Royal Navy as a Surgeon Lieutenant on 16th October 1918 He was promoted Surgeon Lieutenant-Commander on 16th October 1924 and Surgeon Commander on 16th October 1930 He was placed on the Retired List (a.e) on 14th November 1943 with the rank of Surgeon Captain and was reappointed to serve as Surgeon Commander and was finally released on 24th November 1945 (Med Unfit)

During World War II he served in H M S *Courageous* and was one of the survivors when she was torpedoed

Surgeon Captain W H HASTINGS died on the 25th October 1960 He was born on the 9th July 1879

He qualified M R C S Eng. L R C P Lond in 1905 and M.B. B Ch Cambridge in

1906. On July 1923 he passed the final part of examination for Diploma in Medical Radiology and Electrology University of Cambridge.

Surgeon Captain Hastings entered the Royal Navy as a Surgeon on 19th November, 1909. He was promoted Surgeon Lieutenant Commander on 19th November 1914 and Surgeon Commander on 19th November 1918. He was placed on the Retired List at his own request on 1st February 1927 with the rank of Surgeon Captain.

During World War I he served on S S *Magic* and H M S *Blande* giving valuable service during the war.

Surgeon Captain R. H. McGRIFFEN *O B E* died on 8th January 1961 at the age of 80. He qualified M B B Ch University of Ireland in 1904. He entered the Royal Navy as a Surgeon on 21st November 1904 and was promoted Surgeon Lieutenant Commander on 21st November 1912 and Surgeon Commander on 1st October 1917. He was placed on the Retired List (age) with the rank of Surgeon Captain on 2nd January 1931 and was re-employed on 14th June 1939 as a Surgeon Commander. In July 1940 he served in the rank of Surgeon Captain and he reverted to the Retired List on 28th October 1945.

Surgeon Captain McGriffen was awarded the *O B E* on 12th December, 1919.

On 12th May 1943 a letter of appreciation was sent from the Medical Officer of Health, Exmouth Urban District Council expressing appreciation of Surgeon Captain McGriffen's treatment and disposal of casualties during a recent air raid.

Surgeon Captain R. KENNEDY died on 29th November 1960. He was born on 5th January 1876.

Surgeon Captain Kennedy qualified M B B Ch University of Ireland in 1901. He entered the Royal Navy as a Surgeon on 16th May 1903, and was promoted Surgeon Lieutenant Commander on 16th May 1911 and Surgeon Commander on 1st January 1917. He was placed on the Retired List (age) on 5th January 1926 with the rank of Surgeon Captain.

HONOURS AND AWARDS

Companions of the Most Honourable Order of the Bath

Surgeon Rear-Admiral William Percival Edwin McIntyre, Q H P, M.D., B Ch.
Surgeon Rear-Admiral George Phillips Q H S, M B, B Ch, D L O.

Officer of the Most Excellent Order of the British Empire

Surgeon Commander (D) Frederick Arthur Pearse, R N.
Surgeon Lieutenant-Commander John Stuart Pepys Rawlins, *M B E*, R N.

HIGHER DEGREES

F R C P Ed.—Surgeon Captain E. James.
M Sc. (Radiobiology).—Surgeon Lieutenant T. L. Fallowfield.
D A.—Surgeon Lieutenant D. E. Day.
D R C O G s.—Surgeon Lieutenants H. Bodsworth, T. R. Gould, B. G. Hunt, P. A. Johnson, J. P. Lissenden, & F. McGann, R. M. Ridsdill Smith, R. W. K. Rogers.
F F A (Primary).—Surgeon Lieutenant Commander N. G. Hersey.
D P M.—Surgeon Lieutenant Commander F. C. S. Pearson.
D L O.—Surgeon Lieutenant Commander M. J. Boyle.

PROMOTIONS

To Surgeon Lieutenant-Commander.—R. R. A. Coles, H. G. Knox, J. H. Stewart, R. N. F. Paul.
To Surgeon Lieutenant-Commander (D).—F. R. B. Mathias.

The following provisional selections have been announced for promotion to date 30th June 1961

To Surgeon Captain—R McMillan Latta P O'Brien E B Martin
To Surgeon Commander—R B Slater P D G Pugh J S P Rawlins P J Preston

TRANSFERS TO THE PERMANENT SERVICE

Surgeon Lieutenants J Bertram E B Beck R P Doherty K P S Lumley

ENTRIES FOR SHORT SERVICE

Surgeon Lieutenants J K Campbell M B Ch B D P V L Giles M B B S N J McCartney Brown M B Ch B J A Savin M B B Ch D J James B D S D L May B D S J M Turner B D S J R White, B D S L D S J P Willis B D S L D S

RETIREMENTS

Surgeon Rear-Admiral D M Beaton *C B O B E*
Surgeon Rear Admiral (D) C J Finnigan
Surgeon Captain (D) A W Y Price
Surgeon Commander J E Davenport

WARDMASTER OFFICERS

PROMOTIONS

To Wardmaster Lieutenant Commander—F V Moth
To Wardmaster Lieutenant—F K Toulson and J Stockton

QUEEN ALEXANDRA'S ROYAL NAVAL NURSING SERVICE

HONOURS AND AWARDS

Commander of the Most Excellent Order of the British Empire

Miss H Moore, Matron in Chief

Member of the Royal Red Cross First Class

Miss Edith Joan McKay *A R R C* Principal Matron

Associate of the Royal Red Cross Second Class

Miss Lily Brooks Head N N.A

PROMOTIONS

To Superintending Sister—Misses P Gould and C Thompson
To Senior Nursing Sister—Miss M M Kemp

TRANSFER TO PERMANENT SERVICE

Miss N R Wallbutton Senior Nursing Sister

TRANSFERS TO SHORT SERVICE

Miss J Robertson Senior Nursing Sister
Miss A E Williams Senior Nursing Sister
Miss A M Furrell Senior Nursing Sister
Miss P B Newton Nursing Sister

Appointed Area Superintendent (Nursing) of the St John Ambulance Brigade South and East Hampshire

Mrs E. F Conlter *A R R C* Q A R N N S (Rtd)

JOURNAL OF THE ROYAL NAVAL MEDICAL SERVICE
ANNUAL REPORT, 1960

Balance Sheet

Assets	£	s	d	Liabilities	£	s	d
Balance (31.12.60) Bank	78	7	8	1961 Subscriptions paid in			
Cash	1	7	1	advance	19	6	11
£600 of War Loan 3½%	342	0	0	Management Expenses	11	10	0
£100 of Funding Stock 3%	82	0	0	Publication Costs			
Deposit Account	513	19	0	(Autumn 1960)	219	8	6
Advertisement charges not					249	5	5
yet paid in							
Winter 1960	5	9	0				
Spring, 1960	13	1	0				
Summer 1960	27	4	6				
Autumn 1960	64	2	6	Balance Creditor	882	5	4
	£1,131	10	9		£1,131	10	9

Audited and found correct
(Signed) F. W. Mitchell,
Warrant Lieutenant R.N.

ADMIRALTY FLEET ORDERS—1960

(This page is perforated for filing purposes)

2352 —Medical Documentation of R N R Personnel on First Enrolment in the R N R and R N V S R.

2381 —Medical Stores—Calf Lymph—Supply Arrangements.

2406.—Married Quarters.

2437 —Medical Stores—Dextran

2438 R N H, Chatham—Medical Store—Closure.

2475 —Surgeons and Agents.

2510 —Passive Defence

2553 —Dental Stores—Silicate Cement (Synthetic Porcelain)

2606 —Surgeons and Agents.

2631 —Civilian Non-Industrial Staff Injured as a Result of an Accident in which the Crown is Involved

2783 —Civilian Staff—Use of Barrier Creams

2952 —Medical Eyesight—Spectacles—Supply Repair and Replacements—Amendments to Charges.

2994 —Medical—Eyesight—Spectacles—Supply, Repair and Replacements—Amendments to Charges

3112 —Prizes—The Erroll-Eldridge Prize

3117 —The St John Ambulance Brigade—Participation of Naval Personnel in Activities

3348 —Income Tax Relief of Uniform Maintenance

Notice

T[illegible] officers to send in original papers on professional subjects, travel, personal experiences, &c. Items of news and matters of interest to the naval medical service will be welcomed from ships and establishments on home and foreign stations. Notices of births, marriages and deaths are inserted free of charge to subscribers.

All articles or communications published in the JOURNAL OF THE ROYAL NAVAL MEDICAL SERVICE will become the property of the Journal with full copyright powers, unless the author declares when sending in the article that he desires to reserve the copyright to himself.

The Harvard system should be employed for bibliographical references, these references being arranged in alphabetical order of the authors' names at the end of the contribution, thus: 'Smith, F. G. (1935) *J. roy. nav. med. Serv.* **22**, 53.' In the text a reference to a publication should be cited by giving the author and in brackets the date, thus: "Smith (1935) believed this to be due, &c."

The Journal is published quarterly, four numbers comprising one volume.

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Articles

IS THERE A CURE FOR STROKES?

BY

Surgeon Lieutenant Commander W. B. WRIGHT, R.N.

RECENTLY I admitted a middle-aged man with fever and pain in the chest. Signs of consolidation were found at the right base. Examination also revealed chronic mitral valvular disease and on observation he was found to have paroxysmal auricular fibrillation. One morning I found that his heart rhythm had returned to normal. An hour later, while still in the ward, I was told that he had collapsed. Hurrying to his bedside I found him drowsy and apparently confused. He was unable to speak, suffering from a full right-sided hemiplegia and doubly incontinent. His heart was again fibrillating. The diagnosis of cerebral embolism was virtually certain. Treatment with intravenous heparin in full dosage was begun immediately through an indwelling Gordh needle.

Before the day was out he could move his leg easily and rudimentary movement had returned to his right arm. By the fifth day he was walking and talking almost normally and could feed himself with his right hand. In the ensuing weeks fine movements steadily returned and speech recovered completely.

DISCUSSION

It is rather ironic that *before* the advent of anticoagulants every effort was made to prevent consecutive clotting after a thromboembolic cerebral accident had occurred (Keschner, 1937) and the diagnosis of such incidents from cerebral hæmorrhage was thought to be a fairly straightforward matter given reasonable care (Merritt and Aring, 1937). With the discovery and isolation of heparin and its first successful use in man it was almost at once applied with enthusiasm to the problem of the stroke (Hedenius, 1941). However it soon became apparent that hopes of a cure for cerebral infarction were not being realized with anticoagulant therapy and that most victims were no better for it (Ushiro and Schaller, 1957) (Schafer, 1959) possibly even worse off from the danger of hæmorrhage (Sibley *et al*, 1957). On the other hand the use of this treatment in such conditions as thrombophlebitis, pulmonary embolism and more recently coronary thrombosis became a widely accepted if not standard practice. Some American workers, clinging to the conviction that anticoagulants had a place somewhere in the treatment of cerebral thromboembolic disease, gathered a great deal of experience in its use.

Millikin *et al* (1958) made the diagnosis of "insufficiency" of the vertebral basilar or internal carotid systems in 179 patients and treated these with anticoagulants with apparently dramatic results. One hundred and seventy two were considered improved, six were unchanged and one died. Established infarction in these systems was also treated in 136 cases and compared with 48 controls. Among the treated cases there were eleven deaths as compared with 23 among the controls. Although the treatment of cerebro-vascular "insufficiency" was enthusiastically advocated, however established infarct was not considered to be a clear indication for anticoagulants without careful appraisal of the individual case.

Fisher (1958) noted dramatic improvement in transient ischemic attacks and slow strokes resulting in complete reversal of downhill progress and almost complete reversal of symptoms in some cases. He could discern no effect on fully developed apoplexy however and stated that reliable conclusions regarding the efficacy of anticoagulants could not yet be formulated.

McDevitt *et al* (1958) thoughtfully postulated that where is established infarction seemed beyond remedy the stroke susceptible patient might be spared cerebral thrombosis by prophylactic anticoagulant therapy. He treated 100 patients who for various reasons were presumed likely to have a stroke (e.g. previous infarction recurrent focal cerebral ischaemia rheumatic heart disease with embolization cerebral occlusion due to a variety of causes) for a total period of 2 291 patient/months. There were 7.9 thromboembolic episodes in that time as compared with 22.9 in a control group of similar patients untreated. He noted however that there were 51 hemorrhagic complications (five cerebral three fatal) during the trial.

Groch *et al* (1959) in a similar investigation noted that long term anticoagulant therapy in the elderly age groups predominantly affected was fraught with difficulty and not without danger. Absenteeism misunderstanding exposure to trauma intercurrent illness and other sources of a bleeding tendency are all much more likely to occur in a relatively aged population. He decided however that with care, such treatment was certainly feasible.

Such diagnoses as slow stroke and cerebral insufficiency and the concept of stroke susceptibility however are rather indeterminate and particularly liable to differences of conception and interpretation among different centres. They afford less than adequate positive direction to the ordinary physician confronted with a cerebro-vascular accident. One of the great difficulties of the situation was the obscurity of the essential pathogenesis of the lesion. Such mechanisms as thrombosis cerebral vascular spasm insufficiency due to narrowed sclerotic vessels and embolization from other sources such as atheromatous carotids were all potential factors in any one case. There was even the spectre of contained haemorrhage masquerading as thrombosis and capable of surviving contrary to the popular conception of the inevitable fatality of such accidents.

In England it was recognized that the importance of such a potentially valuable treatment for such a widespread condition as cerebral thrombosis should not be neglected at least for prophylaxis. A large scale trial was organized by Bradford Hill *et al* (1960). One hundred and forty-two patients were divided into two groups at random and half were treated with long-term anticoagulants. The criteria for admission were that each patient should be under 70 should have had a past or present cerebral vascular disturbance lasting more than 24 hours and that 14 days should have elapsed since the last episode. Malignant hypertensives were excluded. The incidence of further non fatal cerebro vascular accidents did not differ significantly between the groups but there were four deaths from cerebral haemorrhage and one from hemopericardium in the treated series and none in the control group. However much anticoagulant therapy might benefit certain types of cerebro vascular disease it was apparent that if used generally as a long term measure in the presence of such disease such therapy carried a definite hazard of cerebral haemorrhage. It was

noted that the low incidence of further non-fatal cerebro-vascular accidents in the treated group (five out of 71) regarded in isolation might well give rise to the clinical impression that the treatment had been beneficial —(cf. the results of certain American authors in anticoagulant prophylaxis)—comparison of these results with those of the control group clearly showed that this was not so. (The corresponding incidence was four out of 71.) It was also noted that (in contrast to the fate of controls in American publications) the recurrence rate was in any case so low that any form of treatment would require to be almost 100 per cent effective and devoid of serious hazard before it could claim to be of definite value.

There appeared to be four possible explanations for these adverse results —

1. Bleeding induced in new thrombotic infarctions. There was no comparable group of straightforward thromboses in the control group however which should have occurred if this were likely.
2. Cerebral haemorrhage induced by anticoagulants *per se*. Such an explanation would be at variance with the results of adequate anticoagulant therapy in the large series of patients treated for coronary disease in the M.R.C. trial (1959) where the incidence of cerebral haemorrhage was almost negligible.
3. Inadequately controlled anticoagulant therapy. There was however a very low incidence of extra-cerebral haemorrhagic complications which is contrary to what would be expected if this were an important factor.
4. There remained the possibility that small contained cerebral haemorrhage clinically indistinguishable from cerebral thrombosis was the cause of these catastrophes. In this case it would have to be accepted that such 'silent' haemorrhages were commoner than hitherto supposed and a pitfall to be reckoned with.

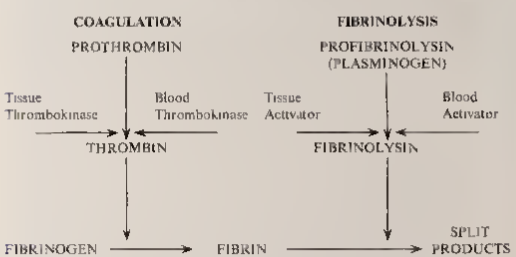
From this work it seemed that the position of prophylactic anticoagulant therapy for the stroke prone victim was untenable.

In the presence of these conflicting clinical trials it is instructive to turn to other work which was proceeding concomitantly.

It had long been realized that whereas blood clot would remain intact in its own serum for days or even weeks if bacterial growth was prevented there was something in the blood capable of destroying the total fibrinogen of the body rendering the body blood incoagulable in a few minutes (Macfarlane 1946). Such fibrinolytic activity was known to occur in some cases of sudden death severe shock and in the course of certain major operations. The isolation of streptokinase (Tillet 1933) stimulated an intense study of fibrinolysis and a reopening of the whole subject of thrombus formation.

It became apparent that side by side with the clotting mechanism there was a fibrinolytic system equally capable of considerable activity and of impressively similar construction (Koller 1960) each system producing finally a proteolytic enzyme—thrombin and fibrinolysin. Just as thrombin splits a small particle (fibrinopeptide) from fibrinogen to produce fibrin so fibrinolysin splits fibrin into a great many polypeptides. Both proteolytic enzymes are derived from an inactive precursor present in the blood (prothrombin and profibrinolysin or plasminogen) the conver-

sion of these precursors to active enzymes being affected by respective tissue and blood activators as in the diagram



When a method of measuring fibrinolytic activity was worked out spontaneous fibrinolytic activity was seen to be a property of the blood of all healthy people and capable of wide fluctuations in response to exercise the administration of adrenaline surgical operation shock and other stimuli (Fearnley 1960) Fibrinolysin was shown to be readily absorbable by blood clot with subsequent lysis (Fearnley 1960)

That there is an effective lytic mechanism which can in a short time cause fresh blood clots to disappear from the circulation was dramatically demonstrated by Wessler and Freiman (1960) who introduced autogenous thrombi in various states of ageing into the blood and allowed them to impact in the pulmonary circulation of dogs. That the capacity of the normal mechanism was enormous was shown by the striking reduction of massive fresh emboli in short periods of time They noted that a certain mass of impacted embolus could be reached however sufficiently large to overload the lytic mechanism resulting in the persistence of emboli which went on in time to organization Alteration in the substrate of the clots accomplished by prior ageing significantly slowed the rate of thrombolysis

Bearing these observations in mind and applying them to the results of the clinical trials which we have reviewed some rational basis for the success of American workers with "insufficiency" and the "slow stroke" becomes apparent These erratically progressive syndromes might well represent repeated embolization of fragments of the original forming thrombus due to its fractionation and dispersal by fibrinolysin and the subsequent successive impaction of these in more peripheral vessels If, into the conception of these two active processes, thrombosis and fibrinolysis proceeding side by side around a newly-impacted thrombus or embolus—the situation fluctuating rather than static, yet contributing the strongest possible incitement to the formation of fresh clots and the occlusion of larger portions of the affected vascular tree" (Jorpes 1941)—one introduces an anticoagulant such as heparin which will block the passage of fibrinogen to fibrin good—even dramatic—results could easily be

predicted Logically the measure of success would be inversely proportional to the time interval between the onset of the crisis and the institution of treatment With a normal blood coagulation time of five to eight minutes as assessed by conventional methods minutes might indeed be critical in shifting the balance between success and failure One can equally well predict that in the case of an impacted thrombus firming with age the fibrinolysin system overwhelmed and vessels and brain tissue dying of anoxia distal to the plug one could hope for little from anticoagulant therapy The clinical studies reviewed here are consistent with this concept and it is apparent that where success is most claimed, the patients have been caught for treatment earliest Carter's recent work (1960) is notable in this respect After treating a large series of patients with anticoagulants he found that immediately treated cerebral emboli recovered well in 66 per cent of 49 cases compared with 33 per cent of 34 cases who were not so treated In cerebral thrombosis on the other hand his results were not so good but where those patients whose lesions were incomplete and who were steadily deteriorating were considered only a recovery rate of 80 per cent was claimed He concluded that in cerebral thrombosis of sudden onset (and he cited as an example the patient found in bed with a stroke) anticoagulants did not improve the natural history of the disease For an adequate clinical diagnosis of cerebral embolus he insisted on a very sudden unilateral cerebral lesion developing during waking hours in a patient with a known source of potential emboli The development of such a lesion during waking hours implies the admission of the patient to hospital and the initiation of treatment the same day The patient who develops cerebral thrombosis while asleep is unlikely to arrive in hospital on the same day that he went to bed The difference of time lapse between these two situations cannot be excluded as a possibly highly significant influence over the results quoted This might well resolve the paradoxical conclusion that only a "fast embolus" or "slow stroke" responded to anticoagulants

Marshall and Shaw (1960) in a recent attempt to elucidate the results of early treatment of cerebral thrombosis with anticoagulants drew up a careful clinical trial using 51 patients Their criteria for admission to the trial were that patients should be treated within 72 hours of the onset of the lesion however and not less than twelve hours after arteriography so that the site of arterial puncture would be effectively sealed (i e by thrombus formation!) to avoid bleeding from the site He concluded that the treatment was not of value

But what of the effect of unfettered autogenous fibrinolytic activity on cerebral vessels which have been exposed, however briefly to the hypoxia of a stagnant circulation? As already mentioned in relation to the clinical trial of Bradford Hill *et al* (1960) there is evidence that haemorrhage after thrombosis is less of a danger than might be anticipated Whisnant (1960) having produced cerebral infarction in rats introduced a high concentration of fibrinolysin into the feeding vessel The percentage of infarct which was haemorrhagic was no more than that of controls similarly infarcted but not treated with fibrinolysin

One might conclude fairly confidently therefore, that where a cerebral thrombo embolic accident occurs *immediate* treatment with heparin in adequate dosage is not contraindicated and can be expected to achieve anything from good to spectacular results

The vital importance of an accurate and *immediate* diagnosis becomes at once apparent For a successful result one must be sure of the pathology, yet there is no time for any elaborate diagnostic procedure Where the cause is manifestly an embolus from elsewhere there is no difficulty Where thrombosis is misdiagnosed in the presence of cerebral artery spasm or vascular insufficiency one can hardly conceive of great detriment to the patient resulting

Treatment of intra-cranial hæmorrhage however with rapid heparinization is an irrefutable death sentence Here it would seem is the answer clearly in the negative

However when we return to our wards and are again confronted with the ageing patient, prostrated and incontinent with a hemiplegia that leaves him only half alive often with only half a mind we wonder if the situation has really been resolved Instead of considering only survival and death are there not three potential outcomes to be weighed? My patient evinced the opinion that he would rather have died than have remained in the condition in which he found himself One might accuse him of facile thinking pardonable in the circumstances but on reflection I entirely agree with him There must be few medical men who have had to deal with hopeless hemiplegics who have not decided that they themselves would rather be dead than like this (and when cerebral hæmorrhage occurs in the guise of thrombosis it would seem most unlikely that those capable of surviving it are also capable of much functional recovery)

In a recent follow up of hemiplegia (Adams and Merritt 1961) it was shown that only 40 per cent of cases could expect a reasonable functional recovery whereas the remainder would either be permanently crippled or dead within two months If it became apparent that the figure for recovery could for example be doubled by any treatment at the expense of a few more deaths it would surely not be discarded out of hand? The total human suffering represented by such a change in outcome would be very much less One must bear in mind the age group predominantly affected by these conditions the reluctance with which their management is undertaken by a younger generation of relatives and the complete emptiness of their lives in the time left to them before the disease strikes them again or infection breaks through their defences

These are relevant considerations in the circumstances The almost superhuman achievements of younger people in overcoming severe disability and their dauntless good humour are not mirrored in the tired old man who gets a stroke Without almost complete recovery his life is almost at an end The doctor who has withheld treatment at a time when it was possible because he was not quite sure of the absence of cerebral hæmorrhage will derive small satisfaction from the spectacle of such a cripple

It would seem possible that wider use of anticoagulants in thrombotic apoplexy is not quite the anathema it would seem and that further appraisal is still merited

In conclusion I should like to make note of early work which might well carry the battle against apoplexy a stage further

It will be recalled that only one of the two systems thrombosis and fibrinolysis at work on the forming thrombus, is influenced by anticoagulant therapy, that of

fibrin formation With the isolation of human fibrinolysin (plasmin) we have a final another weapon The augmentation of autogenous tibrinolytic activity from natural sources might shift the balance further in favour of the survival of the occluded brain and furnish that essential time element for accurate diagnosis Some such measure is patently essential if the great majority of strokes—i e those which occur with no hospital facilities immediately to hand—are to be treated successfully Freiman *et al* (1960) has shown that autogenous impacted thrombi are susceptible to fractionation and dispersal with systemic plasmin and that clots treated within four days could be partially or totally resolved Clarke and Clifton (1960) have treated ten cases of cerebral vascular thrombosis and embolism some of which were over two weeks old with intra-arterial fibrinolysin Half of these appear to have made a dramatic improvement or recovery

It may well be that there is much more hope in the future for the stroke victim Further developments would seem well worthy of our attention

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A CONCISE TREATISE ON MARINE SCIENCE

Chapter II—Oceanography

An account of Sea Zones and Provinces, Waves, Tides, Currents and the Deep Sea Floor

By Surgeon Commander J Glass, R.N.

Topography of the Sea

The large water masses are not distributed evenly over the earth's surface, with 43 per cent in the northern hemisphere and 57 per cent in the southern

The shore to ocean relationship is arbitrarily divided into zones In general this meeting area of the seas and shore of Continents is the tidal zone and from the shallow coastal waters extends a comparatively shallow continental shelf to a region where the depth is about 100 fathoms and then goes down to the continental edge This varies in distance from the continental shores many miles in the North Sea region and only a short distance off the West coast of Africa South America or the Californian coast

The 100-fathom contour used to be taken as the boundary between the continental shelf and the slope however at present it is customary to place the division where the gradual declivity of the shelf changes abruptly to a steeper descent to the abyssal depths Over the world the average depth at which this change occurs is 72 fathoms and the greatest depth of any shelf is probably 200 to 300 fathoms

Going deeper still is the continental slope which extends to 1 000 fathoms and from thence is the deep abyss

A vessel of the Dutch expedition of 1929 the *Willebord Snellius* first recorded the great depth of 6 32 miles off the Philippines

The Soviet surveying ship *Vitiaz* recorded in 1957 the deep sounding in the Marianas Trench East of Guam—5 993 fathoms 318 feet deeper than the record depth found by H M S *Challenger* (1950 1952)—5 940 fathoms At that depth the pressure is nearly seven tons per square inch

The other great deeps are the Horizon Deep in the Tonga Trench which reaches 5 814 fathoms and the Mindanao Deep East of the Philippines reaching 5 740 fathoms

These Deeps are not numerous about 57 are recorded 32 in the Pacific, 19 in the Atlantic and five in the Indian Ocean with one lying between the Indian and Pacific Oceans They are given various names and the origin of these Deeps and in fact of the ocean basins as a whole is surrounded in conjecture The Wegener theory proposed by the Austrian oceanographer in 1914 supposed that before the Carboniferous era a single continent existed known as Pangaea The surface of this continent was composed of a substance of lighter material than the substratum base upon which it rested Then in the Carboniferous period great forces of tides and surface cooling acted on this top crustal layer and broke up the large single land mass into separate

groups which drifted to the present known position. The theory explains in part some geological and biological similarities between the eastern and western sides of the Atlantic. (Further discussion of this theory is noted under heading of the Deep Sea Floor.)

The more orthodox theory is that of rising and lowering of the ocean floor by mass weight shift by temperature change, bulkwater pressure and variable atmospheric conditions.

Ommanney (1955), points out that the controversial area of the Pacific is the basis of the main theories. Most drift theories infer the Pacific was a permanent original depression in the earth's crust and the orthodox theories suppose the Pacific Continent mass perhaps in northern and southern main bodies were separated by a narrow body of water. The land masses are alleged to have been covered by water in the early Tertiary era and that the land mass on the western side has not yet completed this process. The numerous islands of the western side of the Pacific are supposedly the summits of submerged arc-shaped mountain chains breaking surface. This is borne out by the convexity shape of each of these arcs towards the ocean, and as well, is usually bordered by a deep trench whilst between the arc and the mainland is a shallow basin sea. The northerly arc is formed by the Aleutian Islands enclosing the Bering Sea and bordered by the Aleutian Trench. Then further south the Kurile Islands which enclose the Okhotsk Sea is bordered by the Tuscarora Deep. Still further south the system becomes complex and several arcs make up the Philippine-East Indies complex. Continuing south New Zealand and New Caledonia form an arc enclosing the Tasman Sea.

The deepest Atlantic Ocean sounding is in the Atlantic off Puerto Rico—5 227 fathoms. It is in this area that the deepest North American Trench reaches 30 246 feet. Russel and Yonge (1944) noted that as a whole three quarters of the ocean lies deeper than 1,000 fathoms and half of the ocean lies between 2 000 and 3 000 fathoms.

Smith (1939) quotes Hesse who calculated the distribution of depths of the seas over the earth as follows:

15·6 per cent of sea bottom is	0–5 900 feet deep
19·3 per cent of sea bottom is	5 900–11 800 feet deep
58·4 per cent of sea bottom is	11 800–17 750 feet deep
6·5 per cent of sea bottom is	17 750–35 600 feet deep

The slopes are considered among the most imposing features of the surfaces of the earth. They are the walls of the deep sea basins and, as well, they are the farthermost bounds of the Continents the true place of the beginning of the sea. The slopes are the longest and highest escarpments found anywhere on the earth and their average height is 12 000 feet. In some places they reach the vast height of 30 000 feet. No continental mountain range has so great a difference of elevation between its foot hills and its peaks.

That imposing under sea range of mountains and peaks the 10,000 miles long Atlantic Ridge which rises in Mid-Atlantic near Iceland and runs south midway between the two Continents and continues south to 50°S latitude turns eastwards under the tip of Africa and then runs towards the Indian Ocean, rises at certain points

to towering heights [illegible] lies above s[illegible] Some of these peaks which rise [illegible] surface are the Is[illegible] group Pico is the highest rising [illegible] from the ocean floor [illegible] 000 feet showing above the sea Another group of peaks are the Rocks of St Paul the Asceusions and Tristan da Cuuha.

Near the Eqnator there is a deep mountain pass—from east to west the Romauche Treuch—a loue porut of commuuication between the deep basins of the eastern and western Atlantio

The Pacific and Iudiau Oceans bave ranges that compare to this Atlantic Ridge These too are interesting if smaller r inges In the central Pacific the Hawaiian Islands are peaks of a 2 000 mile long range In the western Pacific a broad plateau conuects the South American coast and the Tuamotu Islauds iu the mid Pacific

The floor of the Pacific has no median ridge bnt parts of the southeru and central areas are raised up to depths of less thau 2 000 fathoms and ou this raised portion are the innumerable volcauic islands arranged in arc shaped archipelagos

The central Pacific shows similar shallow basins which however are submerged Tha theory is that these two great laud masses that occupied the area contained numerous lakes aud shallow ucarly enclosed seas These masses as previously uoted Ommanney (1955) probably subsided in the late Mesozoic or early Tertiary era starting on the eastern now the deeper side In the Iudiau Ocean a long range broader aud deeper than the Atlantic Ridge, runs from India to Antarctica

Deep Sea Trenches

The Pacific Ocean is also liberally ranged with deep trenches These deep cauyons go very deep below the average level of the oceau floor Running parallel with many of these trenches are chains of volcanoes which are centres of earthqnake activity

The trenches then have been described as a ring of faults or cracks in the earth s crust of the Pacific area

The origin of these trenches which is continually ru a process of grinding away at the edges generating violeut distnrbances, is obscure

One theory snpposes the surrounding Continents are thrusting slowly outwards and thus crumpling the edges of the sea floor downwards to form treuches Another idea is that slowly circulating connection currents in the semi plastic rock deep beneath the earth s crust are forcing the ocean floor downwards possibly where the treuches are Press Report 7

Zones and Provinces of the Sea

The waters of the world can be divided tuto various zones and provinces Shallow waters vary in differeut regions and show changes corresponding to the horizontal distribntion of prevailing sea life which is the result of differeuces in temperature These zones do not fnlly depeud on latitude bnt rather on hot or cold currents.

The classificatiou which follows Ray aud Ciampi (1958) is a comprehensive index of sea areas linked with the sea life it snpports This section of the chapter has eqnal claims to appear in Chapter III Part Three The priority giveu is for ease of presenting definitions

ZONES AND PROVINCES OUTLINED

1 [illegible]
A Tropical
B Temperate
C Arctic and Antarctic

2 *Substrate Zones*

Province A—The Oceanic Province

Light Zones
1 Euphotic (Oceanic Pelagic)
2 Dysphotic (Abyssal Pelagic)
3 Aphotic (Abyssal Benthic)

Sub Provinces
1 The Benthic
2 The Pelagic

Province B—The Neritic Province
1 The Benthic
2 The Pelagic
(a) Planktonic
(b) Nektonic

Sub Zones
(i) Neritic-Pelagic Zone
(ii) Neritic—Benthic or Littoral Zone
(a) Eulittoral or Tidal
(b) Sublittoral or Non-Tidal

3 *Special Zones*
A The Mangrove
B The Sargasso Sea
C The Coral Reef
(i) Fringing Reef
(ii) Barrier Reef
(iii) Coral Atoll

1 *The Temperate Zones—Tropical Temperate and Arctic*

A *The Tropics* Never falls below 68 F and near the shores most tropical waters are 75°F 80 F all year It is characterized largely by endemism All animal kingdom phyla are represented Animal groups seem to be more diverse than anywhere else Here are the clearest waters of all zones the lowest of tides and the habitat of coral reefs

These seas are divided into three regions the Atlantic the East Pacific and the Indo-Pacific Even in Tropical waters temperatures of 54 F are found at a depth of 600 feet and the actual lower limit of this zone is only 300 feet

B *Temperate Zone* The waters of greatest temperature variation Temperatures do not generally rise above 70 F although it can sometimes reach 80°F —and then it may have temperatures only a little above freezing in the northern winter regions The shores are often covered with dense beds of brown algae, scarce in the tropics

C *Arctic Zone* the waters never get warmer than 41° F 45° F in the summer and reaches these temperatures only for a short period Ice is constant in floe or iceberg type The shores are rocky and the tides high In the *New Scientist* of 12th May 1960 under the collection of articles called Trends and Discoveries there is noted that an expedition of 55 scientists has commenced oceanographic hydrographic geophysical and biological studies of the Canadian Polar continental shelf The shelf is stated to be some 1 500 miles long and some 100 200 miles wide extending to the Arctic seas

The base of the party was Isachsen on Ellef Ringnes Island

2. *The Substrate Zones*

This zone refers either to the ocean bottom or to the water above it as both are able to support life This zone is divided into two main provinces, (a) The *Oceanic Province* over the deep sea (b) *The Neritic Province* over the continental shelf Both of these are further sub divided into two sub provinces (1) *The Benthic* or sea bottom (2) *The Pelagic* or open water The pelagic animal dwellers have a further sub division noted by their swimming ability (a) *Planktonic*—referring to wanderers who are poor swimmers *per se* the microscopic life and the very small animals which are the most important creatures of sea life the diatoms (b) *Nektonic*—free movers in water—fishes and re-entrants

(A) *The Oceanic Province* Water beyond the continental shelf can be divided into light zones

(i) Euphotic Zone—of good light (Oceanic Pelagic)

(ii) Transitional Dysphotic Zone—of dim light (Abyssal-Pelagic)

(iii) The Abyssal or Aphotic Zone—of no light (Abyssal Benthic)

(i) *The Oceanic-Pelagic Zone*—varies greatly in depth but generally not more than 600 feet deep All nektonic-pelagic animals whether Oceanic or Neritic must be alert or protectively coloured or both to survive because of complete absence of hiding places In this zone are found the swiftest swimmers Colonration is usually counter shadded or obliterative composed of blues or greens dorsally and white or silver hues on abdomen i e the mackerel family The Nektonic species which are slightly heavier than sea water must swim slowly but constantly to keep from sinking The dominant nektonic-pelagic animals depend on plankton or plankton eaters directly and indirectly for food as there are no large plants and no organic debris in this zone

(ii) *Abyssal Pelagic Zone*—life here depends on the fall of dead plankton from above, or on other members of their zone for food There are no herbivores This is a stable and uniform zone where changes in light and temperature and water movements are slight Animals with fragile bodies are found The larger fish have elongated shapes The low temperature and the high pressure prevents efficient formation of skeletons which are weak. Pressure causes protoplasm to take up more water and the tissues are gelatinous Archaic animals are common. no doubt due to comparative lack of competition

(iii) *The Abyssal-Benthic Zone*—The least known zone of cold lightless almost motionless water

The deep sea floor is carpeted with sediments which have been slowly piling up over millions of years The skeletons of the various pelagic organisms are found in these sediments In the shallower North Atlantic the *proto-zoan oozes* consist mainly of globigerina Deposits of foraminifera, protozoan and the pteropod molluscs form the *calcareous oozes* which covers about one seventh of the expanse of the deep sea floor Pettersson (1954) notes that nearly 50 million square miles of deep-sea bottom are estimated to be covered by calcareous ooze whereas diatom ooze lags far behind with twelve million square miles The remaining fraction is overlaid with red clay in which the remains of the organisms are less conspicuous and this sediment is found in the deepest part of the ocean beyond 4 000 metres which is a sterile medium for life

These barren parts of the Pacific deep sea floor covered with red clay forms a deposit containing a basis of hydrated aluminium silicate iron with some organic remains volcanic mineral and pumice fragments and nodules of manganese peroxide These substances were found in the sweep catches taken by the earlier H M S *Challenger* (1872-1876) and the *Albatross* (1947 1948) expeditions (Marshall 1954) Support and anchorage is difficult so animals have long stalks or hairy long feet The large Japanese spider crab has legs which can span 15 feet and is the largest known crustacean of this region The Deep Sea Floor will be further studied at the end of this section

(B) *The Neritic Province* The boundaries are the shore line and the outer limit of the continental shelf where present at a depth of about 600 feet This zone is mainly euphotic and is most variable by temperature animal and plant life nature of sea bottom and the movements of water

The Neritic Province is divided into two major zones

(i) *The Neritic-Pelagic Zone* There is an overlap between oceanic-pelagic and the neritic pelagic zone however as much of the animal life in this zone is dependent on the sea bottom for existence during some time of their life span Pelagic invertebrate larvæ usually settle to transform to sessile benthic adults and many of these pelagic animals feed on or near the bottom Life in this zone includes planktonic larvæ fish eggs crustaceans pteropods squids most of the shark family and most bony fishes A good number of this group could not survive if they strayed into the oceanic province

(ii) *The Neritic Benthic or Littoral Zone* This zone displays the greatest diversity of life especially in a sub-division of this zone the Coral Reef The sub-divisions are defined arbitrarily by water movements

(a) *The Euhttoral or Tidal Zone* which is bounded by the high and low water levels of the highest spring tides which varies with geographical locations

(b) *The Sublittoral or Non Tidal Zone* which exists from the low water level to the edge of the continental shelf Further minor-sub-divisions within these zones define the various communities of this province

(a) *The Eulittoral Zone* Here is the harshest environment of the sea as shore-side weather as well as changes in salinity light friction and buffeting of waves occur Food too is scarce and exists for most animal life when the water covers them Thus as conditions become more like that of the land and as life becomes more and

more impoverished it is not surprising that many animals and plants show a tendency towards full terrestrial existence Further classifications are made by rocky sandy or muddy bottoms and of their various combinations

(b) *The Sublittoral Zone* The same types of animals and plants of the Tidal Zone are typical in this zone Species here are more varied and flourish more easily Almost every *phyla* of the animal kingdom is represented The life supported varies again according to each or combinations of rocky sandy or mud bottoms As before the sand/mud mixture supports the greatest amount of life and coarse sand or gravel supports the least The mud dwellers are usually delicate in fairly deep water

3 There are as well three *Special Zones* all Tropical and Littoral which have unique features

(A) The Mangrove Zone—a type of muddy shore

(B) The Sargasso Sea—a distinctive plant community

(C) The Coral Reef—a special rocky zone

A *The Mangrove Zone*—World wide muddy the estuarine flats of the Tropics which grow mangrove trees The beginning of mangroves means the end of the shallow sea for in the root of the plants debris coral sand and mud are trapped and a land building process begins As the debris gets thicker and drier the mangroves themselves die out and loamy land is formed

B *The Sargasso Sea*—In the great circular eddy of the central Atlantic from Bermuda in the south to the Bahamas in the west the Sargassum weed a floating brown algae exists in vast quantities to form a distinct community This weed breaks away from its anchorage on rocks in the Carribean during stormy periods and is then carried out to sea by the Gulf Stream At sea it lives and grows but it is doubted if it reproduces there It is not however a vast packed mass and certainly does not act as a hazard to navigation Apart from the weed in these waters the area would be regarded as sterile As stated earlier the clearest waters of the seas are found here It is also an area of sinking waters where nutrients are scarce

C *The Coral Reef*—These rocky formations owe their existence to groups of animals and plants which deposit calcium around themselves as a protective skeleton Although the name is given to the limy reefs built mainly by the stony or madreporite coral these small colonial animals are not the only reef builders Hydroid milliopores known as the "fire corals" the forminferons calcareous algae and bryozoans also play a dominant part

Temperature is the important factor and a temperature reading of 68°F is the minimum for this building process At the higher temperature of 74 F large branches of coral take form Coral builders withstand high temperatures up to 132 F when uncovered by low tides for short periods in the sun Stony corals do exist in cool temperate waters but reefs, however are not formed Another factor for coral reef growth is moving water at the right speed It also requires a firm substrate to attach itself and does not grow well in areas of cold upwelling water the Eastern Pacific for this reason has poor coral fauna formation The next factor is depth of water and as the symbiotic oxygen supplying flagellate protozoans that live in the coral polyps do not exist below 150-200 feet depth growing reefs are not found deeper As well clarity of water aids successful growth as maximum light is then available

[illegible] is another essential so that mouths of rivers are without such formations and where there is heavy tropical rainfall the coral reefs are poor and sparse

The common latitude span of growth lies between 30°N and 30°S Reefs flourish and grow and then after many years or altered circumstances of physical conditions by wind rain waves or boring animals the reefs die and slowly disintergrate to sand or dissolve in the sea

There are three types of reefs

(i) *The Fringing Reefs* which follow the coasts near the shore
(ii) *The Barrier Reef* which is separated from the shore by a lagoon
(iii) *The Coral Atoll* which is a circular ring like island formed by the sinking of a volcanic island at sea Most of the life of the reef is Benthic or Nekto Benthic and is largely an animal realm

For convenience the ocean floor can be divided into various zonal areas which in part employs previous descriptive terminology (Russel and Yonge 1944)

1 *The Littoral Zone* extends from the shore to about 20 fathoms
2 *The Sub-Littoral or Shallow Water Zone* which extends to 100 fathoms
3 *The Continental Deep Sea Zone* from the continental edge down the slope to a depth of 500 fathoms
4 *The Abyssal Zone* the depths beyond 500 fathoms

Each zone can be further sub-divided according to the distinct population inhabiting each sub-division

1 *The Littoral Zone* subdivided into five areas below the low tide mark with distinct sea life associated in each belt

(a) *The Laminaria Belt*—seaweed forests home of mussels worms snails starfish and crustacea.
(b) *The Zostera Belt*—eel grass forming in sheltered pools or rooted in estuary mud It is true grass not a seaweed
(c) *Hard bottom*—associated with sponges hydroids and corals
(d) *Sandy bottom*—associated with burrowing sea animal life—the bivalves carnivorous snails worms and crustaceans
(e) *Muddy bottom*—burrowers are also typical here the anemones the sea cucumber or trepang, small special crustaceans

2 *The Sub-Littoral Zone or Shallow Water Zone* has similar divisions noted for the above zone There is a soft or sandy or muddy clay bottom mixed with stones and rocks and with a host of empty shells which provides residences for interested sea animal life Sea carnivora and sea animals which feed on particles in suspension animate or inanimate are abundant here Down to 60 fathoms there is a large number of living coralline weeds or nullipores which is an important constituent of the sea bottom

3 *The Continental Deep Sea Zone* supports the fauna of the continental slope On rocky bottoms are stone coral big bivalves brachiopods and deep sea sponges

4 *The Abyssal Zone* The inhabitants here are fewer in number and different in appearance Conditions are uniform—there is no vegetation no exposed rocks On the bottom are the layers of soft ooze where the long stalk animals residing here lift their bodies clear of the mud There are some alcyonarian corals, sponges,

crustacea with long legs sea spiders some bivalves and many luminescent fish Practically all deep sea animals are coloured white grey black or red while no blue or green animals are found and a few creatures are even transparent

The Deep Sea Floor

In great depths the lime content is greatly reduced generally setting in at 15 000 feet and progressing downward so that below 18 000 feet carbonate of lime is comparatively rare The result is that the white calcareous ooze is replaced by the red clay sediment as previously noted (A (iii)) a sediment poor in lime but rather rich in ferric hydroxide and manganese peroxide The colour then varies from whitish red to dark chocolate brown This red clay covers about 40 million square miles of the deepest ocean floor The Tertiary era which is assumed to have been a period of warm climate conditions where polar ice was virtually absent would mean as well that the motive power in the shaped melting ice to impel the bottom currents of the deep Arctic and Antarctic was also absent

It would follow then that the great ocean mass below the 1,000-fathom level was warmer to the extent of about 10°C higher than at present, and would in fact be similar to the land locked conditions of the Mediterranean which is not subject to Polar influences Under these conditions the bottom waters would also be more stagnant and thus the deep lime dissolving facilities should have been small although the surface production of calcareous shells should have been greatest in the higher surface temperature

With these two major factors presenting there is no reason for the extensive layers of red clay to have formed in the pre Quarternary age However the *Albatross* expedition took samples and surfaced long red clay cores in the Atlantic and Pacific which showed the lower layers of the core to be laid down in the Tertiary age The explanation was postulated by Pettersson (1954) that the submarine volcanic activity produced the volcanic minerals from laval beds containing the normal components of red clay In addition these submarine volcanoes produced volumes of acid fumes as the molten magma welled up through the ocean floor to react with sea water rich in chlorides leading to an hydrolysis action on a tremendous scale producing vast quantities of mineral acids and carbon dioxide The carbon dioxide would remain in solution in the high water pressure depths and thus increased the capacity of deep waters for removing quantities of lime This activity together with the strong local bottom currents produced by these submarine upheavals laid down the means for conversion of calcareous ooze into Tertiary age red clay

Pettersson (1954) wrote of Arrhenius interpretation of changes in calcareous sedimentation which were linked to conclusions that the ice ages were characterized by a greatly increased activity of trade winds a phenomenon which was not however reflected by any marked shift in the latitudes of the equatorial system Sedimentation changes, he believed were due then to a strong upwelling in equatorial divergences with a consequent improvement of the nutrition of surface plankton

This view is different from that noted by Shott who believed that during glacial epochs surface water in the tropics was cooled by as much as 10 C and that the extraction of $CaCO_3$ was much reduced If this was the case the glacial stages would

be characterized by a *low* lime content in the sediments Arrhenius points out that his findings are, in fact, the reverse

Revelle more recently noted that these contradictions are not necessarily hard fast divergent views In some regions the cooling of surface water may have a predominating effect on tropical pelagic sediments during glacial periods whereas in others the increased productivity brought about by intensified atmospheric and oceanic circulation may have been the primary factor

Riedel has been able to trace the evolutionary changes of certain groups of radiolarians from the long deep-sea cores taken in areas with a low rate of sedimentation going from the Recent Era back to at least the Lower Miocene These trends were checked in Tertiary deposits on land and there appears to be agreement that a general evolutionary development occurred simultaneously world wide within latitudes of 40°N and 40 S

Cores taken from the Central Pacific and investigated by Botzen and Dunesen reveal that forminifera showed an abrupt change of fauna content in a core at a depth of 4 5 metres below sediment surface Kolbe working on diatom flora from a long core taken in the same area showed the occurrence of an equally abrupt change Another rather puzzling finding by Kolbe resulted from analysis of two cores from an area in the equatorial Atlantic a few hundred miles from the shores of North West Africa when he demonstrated the remains of large numbers of typical *fresh water* diatoms—shades of the lake of Atlantis

Pettersson (1954) wrote of the Dutch submarine geologist Kuenen of Groningen who worked out the theoretical average thickness of Pelagic ocean sediments and related it to calculations of the laying down of sediments since the birth of the oceans between 2 000-3 000 million years ago and the first successful attempts to measure the thickness of sediment layers at great depths which were made by Weibull using the "reflection method or Seismic signal, aboard the Swedish research ship *Skagerak* in 1946 during an experimental cruise in the Mediterranean

The next stage led to better equipment being installed in the *Albatross* (1947-1948) where some researchers using the same method found that velocity of sound in sediments from the constal shelf was 15-20 per cent greater than in water However Weibull found in some sediments subjected to high pressures substances which showed velocity readings less than that of water

One failure of this method was the lack of information of the nature of the substratum under review And for this purpose the refraction method was tried by Ewing and colleagues off the Atlantic coast and by Hill working from a weather ship in the north east Atlantic

Investigation continued to define what lay below the ocean floor covering and the Austrian geologist Suess conjectured that the rocky strata was not similar to the upper landed rocky crust of earth but was of a deeper strata of this crust He termed it "SIMA" and assumed it to be different from the acidic base granitic composition termed "SIAL" containing aluminium silicate as the major constituent of the surface rocks He hypothesised the SIMA to be formed of basic magnesium silicate His fellow countryman Wegener theorised that the continents were block masses largely Sial balanced on a substratum of Sima which being of a higher specific weight and

greater degree of plasticity permitted the masses of Sial to move with relative freedom in a vertical and horizontal plane. This proposal of a "continental drift" supported by the American investigator Taylor also supposes the Atlantic to be a rift between the two great western continental blocks—North and South America on one hand Europe and Africa on the other. The birth of the Atlantic is thus stated to be in the Cretaceous period and is supposedly still widening through a progressive westward drift of North and South America, and by calculation then the central Atlantic would be no older than 140 million years or perhaps 75 million years.

Since the 1920's this theory had many supporters and critics and the highly sceptical present period geophysicists reject the theory on the questionable source of tremendous energy which would be required to accomplish this movement of a weighty upper stratum over a highly resistent substratum.

It is considered that even the subcrustal convection currents arising from the release of radioactive heat into the substratum would be insufficient to accomplish this huge task.

Movements however in the "vertical" direction are generally accepted and continents and more so parts of continents have emerged to explain the regression and the transgressions of many shore lines attributed to the varying load of formed inland ice on accumulated sedimentary layers.

The early investigators in the *Challenger* expedition noted the substratum of the ocean floor to consist of three types of crustal forms.

The first and most typical substratum layer the sedimentary one in which the velocity of sound was transmitted at a slightly lesser rate than in the basaltic layers.

The second form lies between the sediment and basement rock as a layer in which the velocity of sound is similar to that of volcanic material and of thickness 1½-2½ kilometres.

The third type characteristic of the landward side of the "Andesite line" is of lesser velocity of sound than the other two forms and is similar to that of the continental surface layers.

Efforts made to determine the depth of the sediment on the ocean floor have produced some basic answers. Pettersson (1954) records that in the Pacific the average readings of sedimentary layer is a few hundred metres occasionally rising to half a kilometre. Some investigators have recorded the Pacific carpet depths however at two to three kilometres.

In the Atlantic the accepted average depth of sediment is half to one kilometre whilst Ewing is noted as recording the thickness of sediment in the very deep Puerto Rico Trench to be over nine kilometres.

Laughton (1959) noted that coring investigations in the abyssal plains has revealed that a large portion of the sediment is composed of quartz sand and silt whose origin was from coastal areas. The only means of getting to the abyss would be by highly turbulent transporting currents which kept the material remaining in suspension.

The cause of these high velocity turbidity currents he believed was the result of some violent disturbance on a slope at the edge of the continental shelf as the compressional waves from an earthquake forced the extra water into a sand bed thereby

disturbing its coherence. It takes the top further, the sedimentary mixture with a density as high as 1.5 grammes per cubic centimetre could gather momentum as it rolls down the slope increasing speed to reach a possible velocity of 60 knots. When this torrent reached the bottom of the slope it became destructive, moving large rocks and could break submarine cables. As it reached a gentler gradient it gradually slowed down, first depositing the coarser materials and then the finer, travelling many hundreds of miles doing this before becoming spent. In this manner the small depression of the sea floor probably became filled and the symmetry of the plain as the whole becomes uniform in time.

The finding of the Scripps Institution "Capricorn" Expedition to equatorial and southern Pacific where two vessels carried out this seismic refraction work, confirms that most of the deep Pacific basin is carpeted by a few hundred metres thick sediment in an unmetamorphosed form. Another result of these investigations showed the crust beneath the Pacific to be very thin, with a typical thickness of crust to be five to nine kilometres compared to a continental crust thickness of 30-40 kilometres.

Ewing continued investigations and interpretation of depth charge reflections and findings of submarine volcanic action, noted that below a volcanic layer a basalt layer exists four to five kilometres in depth, comprised of crystalline rocks. At the base of the basaltic layer there is the "MOHOROVICIC DISCONTINUITY" which under deep oceans lies at ten to twelve kilometres compared to 30-40 kilometres depth of this layer under the continents. Beneath this layer the deeper crust of Ultra-mafic rock, peridotite, descends to great depths. St. Paul's Rocks in the Atlantic contains typical peridotites found in layers below the Discontinuity.

A correspondent in Press Report 13 records that Professor Whittard of Bristol University has been at work for a number of years with corers and dredgers to examine the sea bed—with the aid of the research ship *Sarsia* of the Marine Biological Laboratory at Plymouth. These coring drops are charted on a ten minute grid over an area with the exact location fixed on a Decca Navigation Chart and the depth recorded by echo sounders.

The submarine topography is checked as well by use of the oblique Asdic technique.

New techniques, other than seismic surveys, includes underwater photographic procedures as well as recording instruments for the gamma emissions from the sea bed to give another type of map.

Complementary investigations are being carried out by geophysicists at Cambridge dicating the origins and history of the continental slope.

(To be continued)

THE HISTORY AND FUNCTIONS OF A LARGE NAVAL DOCKYARD

BY

Surgeon Commander C. V. Harries, R.N.

This article on The History and Functions of a Large Naval Dockyard, with a description of the medical organization and a résumé of the medical work carried out in 1959, is based on a brochure handed out to the delegates of the Health Congress held at Torquay when they paid a visit to H.M. Dockyard, Devonport, in April 1960.

Ships of the Royal Navy were repaired and fitted out in Plymouth in the reign of Charles the Second (1649-1685). In 1690 a contract was signed for the construction of a dock on the left bank of the Hamoaze—on what is now the site of South Yard—and in the following year was appointed the first Commissioner, whose title was changed to Superintendent in 1832. By 1770 the yard occupied an area of some 70 acres and contained five building slips, the length of the largest being 260 feet. North Yard was commenced in 1844. Eleven years later a tunnel connecting both yards was constructed. Finally, a large extension to North Yard was added at the beginning of this century. In 1941 the intervening Morice Yard was transferred from Army control to the Dockyard. These yards suffered much devastation from the bombing during the last war and rebuilding still continues.

Devonport Dockyard now consists of these three adjoining yards, one victualling and two Armament Depots situated some miles away as well as some smaller outlying establishments. The total area exceeds 400 acres. Industrial workers number 19,000 and non-industrial employees exceed 2,000. The Royal Fleet Auxiliary Section comprises 25 ships and 1,300 persons. The ages of the working population of both sexes range from 15 years to those who have attained their 70th birthday. Except for statutory restrictions applicable to women and young persons, the nature of their employment may require workers to work afloat, in confined spaces or at great heights, whilst ashore many are engaged in jobs involving a potential or actual hazard unless proper supervision and precautions are observed.

Main Functions of the Dockyard

(1) Berthing, construction, maintenance, repair and modernization of ships of many descriptions.

(2) Supplying of armaments and ammunition.

(3) Provisioning of food, clothing and other stores.

(4) Construction and upkeep of buildings, trafficways, caissons, docks, etc., including the installation of mechanical and electrical equipment.

(5) Transport—ashore and afloat—of personnel and material.

(6) Provision of canteens and medical care of workers.

(7) Further education in the shape of the Dockyard Technical College for apprentices.

There are eleven main departments each semi-self-contained working under a manager with the Admiral Superintendent in overall administrative control

Though subscribing to the enactments of the Factory Acts and the auxiliary regulations and orders made under these Acts Naval Dockyards are not factories in the usual definition of the term but consist of a collection of miscellaneous workplaces workshops and storehouses dating from the early 18th century to those of the most modern structure design and equipment offices caissons docks and berths as well as its own railway system

Medical Organization

There is a surgery in North and South Yards and in each of the three depots During working hours each is manned and an ambulance attached or readily obtainable The North Yard surgery is always staffed including public holidays because of the constant presence of a large maintenance contingent One medical officer is always on call during the silent hours to deal with any emergency

The staff consists of one senior and two medical officers—all of whom are Appointed Factory Doctors—three senior and nine surgery assistants one typist and some cleaners who have been taught the basic principles of first aid and have proved most useful in contingencies The senior medical officer is responsible for the medical administration and is the adviser on medical matters to the Admiral Superintendent to whom he has direct access As head of a department he attends Management Meetings and Whitley Council Meetings

Medical Responsibilities

(1) Medical examination and first aid treatment of those injured and/or reporting sick in the Dockyard

(2) Disposal of these persons i.e

- (a) Immediate return to full duty possibly continuing on the attending list
- (b) To light duty—under medical supervision
- (c) To work of a restricted nature
- (d) Excused work for the rest of the day
- (e) Discharged to hospital—Naval or civilian Own doctor told
- (f) To own home to care of own doctor

(3) Disposal of persons reporting back to work

- (a) After absence on sick list
- (b) After absence on hurt list
- (c) Following operations or other hospital treatment

(All above are interviewed and/or examined by a Medical Officer)

Job placement, temporary or permanent frequently presents a difficult problem for instance

(a) The epileptic who is restricted to ground level, ashore

(b) The respiratory afflicted who cannot cope with an atmosphere laden with dust or fume,

(c) The cardiac affected whose diminished cardiac physical reserves necessitate work of a lighter nature

(d) The person who reports with claustrophobia [illegible] of heights subsequent to accident or illness

(e) The monocular person who has lost the sight of one eye from injury The employee is advised to wear unsplinterable lenses

(f) The partially disabled from
- (i) Injury P I D , fractures etc
- (ii) Congenital weakness-- accumulative effects plus ageing
- (iii) Poliomyelitis
- (iv) Paralysis agitans disseminated sclerosis etc ;

(g) The partially deaf Hearing aids are recommended because of the hazard from moving traffic and mobile machinery

(4) Continuation of absence on sick or hurt list Each case is reviewed at three monthly periods With the man's written permission a questionnaire is sent to his doctor and according to the latter's replies decision is made whether the man is retained or invalided is instituted If there is no probable likelihood of return to work, the employee is medically examined in the surgery or at home and the doctor is informed by letter of the conclusions

(5) Receipt recording and onward transmission of Ministry of National Insurance and Pensions Certificates Approximately 1 500 weekly

(6) Routine Examination

(a) Entries Prior to examination all applicants have to sign a form stating whether or not he or she is suffering from or has had various illnesses or disabilities listed below
1 Chest disease
2 Heart trouble
3 Dizzy or giddy attacks
4 Diabetes
5 Gastric or Duodenal Ulcer
6 Fainting fits or blackouts
7 Mental illnesses
8 Injuries or illnesses of muscles bones or joints
Food handlers and young persons are pulmographed The latter and men likely to be engaged in electrical work have their colour perception tested

(b) Young persons are re examined annually until they attain their 18th birthday

(c) Prior to establishment or service abroad

(d) Periodically for workers engaged in those occupations of a hazardous nature or carrying a potential risk

(e) Of claimants for compensation for injuries incurred before 1948 or subsequently invoking common law action

(7) Investigation of working conditions and periodic supervision of canteens

(8) Application of Clinical Preventive Medicine

(a) Inoculation of those proceeding abroad

(b) Anti polio inoculation

(c) Mantoux testing and B C G protection of young persons
(d) Detection of pulmonary T B by inducing close contacts to undergo pulmography and the biennial visit of the Mobile Mass Miniature Radiography Unit
(e) Six monthly visit of the Blood Transfusion Unit

Resume of Work carried out in 1959

Care of injured

First attendances (including eye injuries mostly trivial 3 100)	13 130
Subsequent attendances averaged 3 3	
Placed on hurt list	983
Discharged to hospital	127
Discharged to full duty from hurt list	924
Discharged to restricted duty from hurt list	477
Re-recommended to restricted duty	195
Transferred from restricted to full duty	403
Subsequent attendances at hospital	t 923
X-rays of injured parts in surgery	586
Fractures 137 (Fractures treated in surgery—95)	

Examinations				Total
Adult—on entry			787	
Adult—before establishment			457	
Adult—service abroad			117	
Juvenile—on entry			429	
Juvenile—annual re-examination			423	
Miscellaneous			t44	2,357
Statutory Examinations				Total
Divers	5	Weekly	237	
Founders	80	Annually	80	
Metallisers	5	Quarterly	20	
Mercury workers	5	Quarterly	18	
Limpet asbestos sprayers	12	Quarterly	86	
Koon-coters	13	Quarterly	52	
Radiographic workers	11	Six monthly	22	
Shot blasters	13	Quarterly	51	
(All above require annual chest X-ray)				
Fresh-water tank workers	5	Weekly	260	
Tropical plant workers	t5	Quarterly	60	
Truck workers on starting	214		214	
T N T workers	50	Monthly	598	
Compressed breathing apparatus workers	59	Annually	59	
Chrome workers	8	Fortnightly	197	
Painters	10	Quarterly	40	
Asbestos workers (chest X ray only)	88	Annually	88	
Motor drivers (eyesight test)	230	Biennually	115	2 t97

Preventive Clinical Medicine

Smallpox vaccination	24
Smallpox re vaccination	80
T A B inoculation	125
Cholera vaccination	86
Anti polio vaccination (1st and 2nd dose)	1 316
(3rd dose)	636
Tuberculosis Contacts (Pulmography)	179
Mass Miniature Radiography attendances	11 506
Blood Transfer Unit donors	1,306

A close liaison has been maintained with the civilian hospital authorities and medical practitioners The latter are informed by letter of the disposal of their patients i e to hospital, various grades of duty or invaliding To lessen absence from work continuation of surgery treatment is proffered to the practitioner for patients whose illnesses are not attributable This dockyard is fortunate that there is a Naval hospital in the near vicinity to which employees are admitted for non attributable conditions under reciprocal arrangements with the National Health Scheme

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RADIOACTIVITY

PART II

BY

Instructor Lieutenant-Commander H W OGDEN R N

In the last article an attempt was made to portray the atom as having a central positive and massive nucleus containing protons and neutrons and surrounded by a cloud of electrons The number of protons is the atomic number of the element to which the atom belongs and is given by the numerical order of the element in a list of increasing atomic weights The atomic number of hydrogen the lightest element, is 1 The number of electrons equals the number of protons since each carries unit charge positive in the case of protons and negative in the case of the electrons the atom as a whole being neutral

The electrons are considered to rotate round the nucleus in different shaped orbits within energy shells These shells are designated by K L M etc the K shell being nearest to the nucleus and each shell has assigned to it a definite quantum number representing a certain energy content The K shell has least energy

Each shell can only hold a certain maximum number of electrons, the maximum being given by $2n^2$ where n is the quantum number of the shell For the K shell, $n = 1$ so that the K shall is complete with 2 electrons as in Helium For the L shell $n = 2$ and the shell is complete when it contains 8 electrons as in Neon For the M shell $n = 3$ and so the M shell can hold up to 18 electrons, but it shows a certain stability when it contains 8 electrons as in Argon Similarly for the other shells each shows a stable form when it contains 8 electrons to give the appropriate inert gas

Other quantum numbers determine the configuration of the orbits within each shell These orbits and shells are not rigid paths but are regions where an electron having certain quantum numbers is most likely to be found i e , they are probability areas No two electrons of an atom can have the same quantum numbers, this is Pauli s Exclusion Principle

If an electron is energized for example by absorbing energy when an electric discharge is passed through a gas containing the element, or absorbs energy from radiation it can jump from one energy shell to the next onter one, provided that it has absorbed energy at least equal to the difference between the quanta of the two shells concerned When the electron jumps back, this energy is radiated and from the Planck equation $E = hf$ where E is the energy in ergs h is Planck's constant $= 6{\cdot}62 \times 10^{-27}$ erg secs and f is the frequency of the radiation it is possible to determine f This is in the X-ray spectrum

The number of neutrons in a nucleus is given by the difference between the atomic number of the element and the mass number of the atom, the mass number being its

mass to the nearest whole number relative to the mass of t 16th the mass of the oxygen atom

In this article an attempt will be made to show why energy can be obtained from atoms and why atoms can be radioactive

From certain experimental results concerning the speed of light Einstein was led to the general Theory of Relativity which is summarized in the equation $E = mc^2$ where E represents energy in ergs m the mass of a body or its increase, in grammes and c is the velocity of light approximately 3 10^{10} cms per second The equation states that if the energy of a body is increased by an amount E then its mass m increases the constant of proportionality being the square of the speed of light In other words mass is a form of energy Although Einstein derived the equation from theoretical considerations experimental proof of its validity was eventually forthcoming

Suppose now that an atomic reaction leads to a decrease in mass of the reacting system by 1 atomic mass unit (1/16 of the mass of the oxygen atom and equal to $1\ 66 \times 10^{-24}$ grammes) then the energy which should be liberated is according to the equation equal to $1\ 66 \times 10^{-24} \times 9 \times 10^{20}$ ergs i e $1\ 494 \times 10^{-3}$ ergs This is a very small amount of energy since the erg is the quantity of work done when a force of 1 dyne acts through 1 cm and the dyne is that force which gives an acceleration of 1 cm /sec /sec to a mass of 1 gramme Its size can be pictured from the fact that it takes about 42 million ergs of heat energy to raise the temperature of 1 gramme of water through 1 degree centigrade On the other hand the amount of mass change is also very small If the mass change had been 1 gramme then E would be 9×10^{20} ergs and if this energy were all in the form of heat there would be enough heat to bring the temperature of $\frac{9 \times 10^{20}}{4\ 2 \times 10^{7} \times 100}$ grammes of water from 0 degrees centigrade to 100 degrees centigrade This weight of water is 214 million kilograms or 43 000 tons approximately The energy liberated by changing one gramme of matter into energy is about the same as is obtained by burning 3,000 tons of coal

The unit of energy most frequently used in atomic physics is not the erg but the electron-volt (ev) This is the energy which an electron acquires as kinetic energy as it accelerates under the influence of 1 volt of potential difference in an electric field To obtain the relationship between ergs and electron volts the definition of a volt must be considered Suppose we picture a negative charge in isolation It is surrounded by an electric field which theoretically extends to infinity Suppose now that we have a negative charge of 1 coulomb (approximately 6×10^{18} electrons) in the field at a position A and then move the charge to a position B nearer to the original charge In so doing work will have to be done on the coulomb to overcome the repulsive force between the two negative charges If the work done is 10^7 ergs (1 joule) then there is said to be a potential difference of 1 volt between the two places A and B If we now consider a single electron going from A to B as this electron carries a charge of $1\ 6 \times 10^{-19}$ coulombs, the work done on the electron is $1\ 6 \times 10^{-19} \times 10^{7}$ ergs i e $1\ 6\ \ 10^{-12}$ ergs Thus the energy acquired by the electron under the influence of 1 volt is $1\ 6 \times 10^{-12}$ ergs and 1 ev is therefore equivalent to $1\ 6 \times 10^{-12}$ ergs

A mega electron volt (1 Mev) is a million times this figure i e $1\ 6 \times 10^{-6}$ ergs and

is the energy acquired by an electron as it moves under the influence of a million volts. To convert the energy liberated from ergs units into Mevs the number of ergs is divided by 1.6×10^{6}. Thus the energy liberated by the conversion of 1 atomic mass unit into energy is about $\frac{1.494 \times 10^{3}}{1.6 \times 10^{6}}$ Mev. The accurate value of this is 931. Thus 1 atomic mass unit is equivalent to 931 Mev.

To understand why protons and neutrons are bound together in the nucleus let us consider what happens when a proton and a neutron come together to form a deuteron, which is the nucleus of the isotope of hydrogen deuterium. The rest masses of the proton and neutron are respectively about 1.0081 and 1.009 atomic mass units—the rest mass of a particle is the mass it has when it is travelling well below the speed of light. If it were travelling close to the speed of light its mass would be large, as can be seen by considering the Einstein equation. It would be expected that the deuteron would have a mass of 2.0171 atomic mass units, but in fact careful determination shows its mass to be 2.0147 a.m.u. Thus in the combination some 0.0024 a.m.u. are liberated in the form of energy. The value of this energy is 0.0024×931 Mev. i.e. 2.24 Mev. To separate the particles again at least this amount of energy would have to be absorbed by the deuteron particle and experiment shows that gamma rays (very short wavelength radiation) have to have about this amount of energy before they can split up the deuteron. The reduction in mass that takes place when atomic particles undergo reaction is spoken of as the Mass Defect and the energy released is the Binding Energy.

Another particle that is of importance in radiation is the alpha particle. This is the Helium nucleus and consists of 2 protons and 2 neutrons. If the 2 protons and 2 neutrons are considered separately the total mass is 2.0162 + 2.018 = 4.0342 a.m.u. Actually the mass of the alpha particle is 4.0038 a.m.u. so that the Mass Defect is 0.0304 a.m.u. and the Binding Energy is $0.0304 \times 931 = 28$ Mev. approx. To split up the alpha particle into the separate protons and neutrons would thus require some 28 Mev of energy. As this is quite a large amount it can be seen that the alpha particle is a stable particle.

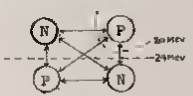
The alpha particle could also be considered as made up of two deuterons as seen in the following equation $_1D^2 + {}_1D^2 \rightarrow {}_2He^4$.

The total mass on the left hand side of the equation is 4.0294 a.m.u. and the mass defect is therefore 4.0294—4.0038 = 0.0256 a.m.u. This gives a binding energy of about 24 Mev.

The alpha particle may also be made from a proton and triton—a triton being the nucleus of another hydrogen isotope $_1H^3$ and has two neutrons and a proton bound together $_1H^1 + {}_1H^3 \rightarrow {}_2He^4$.

The mass of the triton is 3.0170 a.m.u. so that the total mass on the left side of the equation is 4.0251 giving a mass defect for the reaction of 4.0251—4.0038 = 0.0213 a.m.u. The binding energy is therefore $0.0213 \times 931 = 20$ Mev. approx.

A possible explanation of these different binding energies of the alpha particle may be found by visualising the structure of the particle



It can be seen that to split off the proton and leave triton would break three bonds to split the particle into two deuterons would require breaking four bonds and hence require more energy while to split the particle into its constituent protons and neutrons would mean breaking all bonds and presumably require still more energy

Let us now calculate the binding energies for a relatively light atom such as Neon $_{10}Ne^{20}$ and a heavy atom such as Bismuth $_{83}Bi^{209}$ In each case we are assuming that the nucleus is built up from individual protons and neutrons The equation for the building of the Neon nucleus would then be

10 protons + 10 neutrons = $_{10}Ne^{20}$

The total mass on the left of the equation is

$10 \times 1{\cdot}0081 + 10 \times 1{\cdot}009 = 20{\cdot}171$ a m u

The mass of the Neon nucleus is however 19 999 approx so that the Mass Defect is 20 171—19 999 = 0 172 a m u and the binding energy is therefore about 160 Mev This gives an average binding energy per nucleon i e per proton or neutron of about 8 Mev

For Bismuth the Mass Defect is given by

$83 \times 1{\cdot}0081 + 126 \times 1{\cdot}009 - 209{\cdot}0458 = 1{\cdot}76$ a m u

and the binding energy is therefore about 1640 Mev The average binding energy per nucleon is $\frac{1640}{209}$ or again about 8 Mev

Thus gives us a rough—a very rough—approximation that the addition of a nucleon to a nucleus increases the binding energy by about 8 Mev Alternatively if a nucleus is to lose a nucleon about 8 Mev of energy have to be obtained from some source for the loss to be possible

It would seem from this that for a nucleus to lose a deuteron would require an absorption from some external source of about 16 Mev of energy but in fact this is not so Imagine the nucleus to have received 16 Mev of energy, causing the 'loosening' of a proton and neutron from the nucleus These then come together to form the deuteron but in doing so as we have seen some 2 24 Mev of energy are liberated Thus the net amount of energy required to cause deuteron release is of the order of 14 Mev This amount of energy is quite high and hence apart from other considerations deuteron emission is not common

It might be thought that alpha particle emission would also be rare but in fact it is more frequent than deuteron emission To 'loosen' the four nucleons would require the absorption of about 32 Mev of energy but when these four come together to form the alpha particle some 28 Mev of energy are released Hence the net energy

absorption requirement by the emitting nucleus is only of the order of 4 Mev As will be seen later at least 5 5 Mev of energy are required for alpha particle release

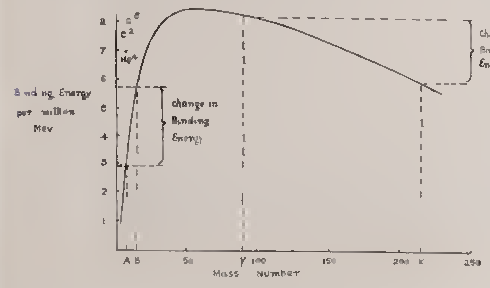
A more exact estimate of the amount of binding energy released by the addition of a nucleon to an existing nucleus can be obtained as follows Consider the two nuclei represented by $_{83}Bi^{209}$ and $_{92}U^{238}$ These two differ in that the Uranium nucleus has 29 more nucleons than the Bismuth and the Uranium nucleus can be considered as made from the Bismuth nucleus by adding 9 protons and 20 neutrons according to the equation

$$_{83}Bi^{209} + 9 \text{ protons} - 20 \text{ neutrons} \rightarrow {}_{92}U^{238}$$

Mass	209 046	9 073	20 18	238 125
Total	238 299			

The Mass defect is therefore 0 t7 approx. a m u and the binding energy that would be released is of the order of 160 Mev The average energy liberated per nucleon added is therefore about $\frac{160}{29}$ Mev or about 5 5 Mev An important result follows from this If a heavy nucleus in the region of Bismuth and Uranium were to emit an alpha particle as four nucleons it would have to absorb some 4 × 5 5 or 22 Mev of energy to do it On the other hand when these four particles come together to form the alpha particle 28 Mev of energy are liberated Thus in fact there appears to be a gain of free energy when alpha emission takes place and it would be expected that alpha emission would take place spontaneously However other considerations do come into the picture such as the charge on the alpha particle both Bismuth and Uranium and elements near to them in the Periodic Table have isotopes that spontaneously emit alpha particles and are thus radio active

If the binding energy per nucleon is plotted against the mass number of the nuclide (the species of nucleus) a curve as shown below is obtained when a line is drawn among the plotted points



The curve shows

(a) Over a broad band between about Mass numbers 40 to 80 the binding energy per nucleon is of the order of about 8·5 Mev

(b) As the Mass number rises above about 80 the binding energy per nucleon decreases i.e. less energy is liberated when a nucleon is added to the nucleus By the same token less energy would be required to cause the release of a nucleon and hence the heavier nuclei tend to be less stable

(c) For light elements the binding energy increases with increasing Mass number and hence the nuclei tend to be more stable

(d) The binding energies for Helium Carbon and Oxygen are exceptional

(e) If one starts with a heavy element such as X and it is made to yield elements in the neighbourhood of Y there is an increase in binding energy and hence the difference in binding energy ought to be released This is the basis of the fission bomb and atomic reactors

(f) If one starts with a light element A and causes an element B to be produced then again there is an increase in binding energy and energy should be forthcoming from the reaction This is the basis of the thermo-nuclear bomb

If one considers the structure of the nuclei of the various nuclides it is apparent that the ratio of neutrons to protons in each nucleus increases with increasing mass of the nuclei For example in Calcium ($_{20}Ca^{40}$) there are equal numbers of protons and neutrons i.e. the ratio is 1 In $_{83}Bi^{209}$ the ratio is $\frac{209-83}{83}$ i.e. about 1·52 to 1 For $_{92}U^{238}$ it is nearly 1·59 to 1 The reason for this is that as the Mass number increases so does the number of positive protons and hence so does the repulsive force between them tending to disrupt the nucleus To offset these increasing repulsive forces more neutrons must be added to increase the n–n and n–p links in the nucleus The repulsive force is approximately equal to $\frac{Z^2}{R}$ where Z is the number of protons present and R is the radius of the nucleus As R is proportional to the cube root of the Mass number A the repulsive force is proportional to $\frac{Z^2}{\sqrt[3]{A}}$ Comparing the values of this ratio for Calcium and Bismuth it can be shown that the repulsive force is about 10 times greater inside the Bismuth nucleus than it is inside the Calcium nucleus

Beyond an atomic number (Z) of about 30 e.g. $_{30}Zn^{62}$ the repulsive force is so great that the binding energy liberated by the addition of a neutron begins to decrease

Each element has a range of neutron to proton ratio in which its isotope nuclei are stable Other isotopes of the element are therefore very probably unstable and hence radio active The direction of their radio activity is such as to try and bring about the stable ratio For example zinc has many isotopes ranging from $_{30}Zn^{63}$ to $_{30}Zn^{72}$ The stable isotopes are $_{30}Zn^{64}$ $_{30}Zn^{66\ to\ 68}$ where the ratio of neutrons to protons is about 1·2 to 1 In $_{30}Zn^{70}$ the ratio is 1·4 to 1 i.e. this isotope has more neutrons than it needs for stability It can turn to the stable form by converting a neutron into a proton which will increase the number of protons by 1 (and hence

form the electron (β particle) and reduce the neutron number by 1. The change in neutron and proton numbers changing a neutral particle into a positive one which means that an equivalent negative charge must also be emitted. This negative charge is an electron and since it is emitted by the nucleus it is called a beta particle. The beta particle usually leaves the nucleus in an excited state and the process of settling down the excess energy may be emitted as gamma rays. This beta emission is frequently associated with gamma emission.

The isotope of Gallium so formed would be $_{31}Ga^{72}$ which is also a beta emitter (+ gamma rays) to form the isotope of Germanium $_{32}Ge^{72}$ which is stable.

On the other hand $_{30}Zn^{62}$ has a neutron to proton ratio of less than 1.1 to 1 i.e. the number of neutrons is too low for stability. To reach stability the nucleus can convert one of its protons into a neutron. This can be done in one of two ways.

Firstly the proton can become a neutron by the emission of the positive charge as a positively charged positron. This particle has the mass of the electron and also a unit charge equal in magnitude to the charge on the electron. Positrons are short lived, however combining readily with ever-present electrons to be destroyed with the emission of what is called annihilation radiation similar to gamma radiation. Zn^{62} does emit positrons and in so doing gives rise to the element whose atomic number is 29 i.e. Copper. Copper 62 is also a positron emitter and gives the isotope of Nickel $_{28}Ni^{62}$ which is stable.

Secondly the proton excess in the nucleus can be reduced if an orbital electron is captured to make the proton into a neutron. This electron is usually one from the K energy shell and the process is therefore known as K capture. (Although the orbital electrons have been described as being in shells these shells are only regions where electrons of a definite energy quantum are most likely to be found i.e. some will not be exactly in the shell and one of these close to the nucleus could be captured by the nucleus.) L capture is known but is much less common since the L shell electrons are not likely to be close enough to the nucleus.

With the loss of a K shell electron an outer electron jumps into the vacant space in the K shell and the energy released by this jump appears as X-rays of a definite energy value since one or more complete quanta of energy are set free. Furthermore the K capture process may result in the nucleus becoming energized by the neutralization process. If such happens then the excess energy may be liberated as gamma ray emission.

This gamma ray emission may be of such energy that it can excite an orbital electron to the extent that an orbital electron is ejected from the atom. The electron is ejected with an energy value equal to the energy of the gamma rays minus the energy quantum that bound the electron in the atom. It is then also to be expected that the "internal conversion electron" will leave a vacancy in its shell and that if this is filled by a further inward jump of another electron then again X rays of discreet energy value will be radiated.

It will be appreciated that if a proton is neutralized then an orbital electron will be freed in any case since the number of positive charges on the nucleus will be reduced by 1.

In the case of $_{30}Zn^{62}$ both K capture and positron emission take place accompanied by some gamma radiation. The radiation from Zn^{62} is divided between posi

[illegible] and K capture in the ratio of about 1 to 9 i e 10 per cent of the radiation is due to positrons

For positron emission to be possible certain energy conditions have to be fulfilled When the nucleus ejects a positron its mass will decrease by the mass of the positron Further as a result of the lowering of the atomic number by 1 an orbital electron must also be freed Thus the atom as a whole loses mass equal to that of two electrons i e the resulting atom is less in mass than the parent atom by 2×0.00055 a m u where 0 00055 is the mass of the electron This mass defect of 0 0011 a m u is equivalent to 1 02 Mev and if this energy is not available positron emission does not take place but K capture does

When both processes are possible electron capture is favoured by a low energy amount being available The nearer this amount decreases to 1 02 Mev the greater is the probability of K capture Electron capture is also favoured by high atomic number since there is now a greater positive charge on the nucleus and the K shell will be that much nearer due to electrostatic attraction between the nucleus and the orbital electrons Decay by electron capture is also more probable if there is a wide difference in the spin quantn of parent and daughter nuclei

When a neutron decays to a proton and vice versa a body known as a neutrino is involved The neutrino is a neutral body of very small rest mass and in the instance of neutron decay the equation can be written

	Neutron	→	Proton	+ electron	+ neutrino
Mass	1		1	0	0
Charge	0		+	—	0

Both sides of the equation agree as to total mass (approx) and charge The electron is emitted as the beta particle together with the neutrino and to account for the continuous range of energy shown by beta particles it is thought that the energy available is shared between the electron and neutrino the fraction carried by each being continuously variable if a large number of nuclei are considered The energy available here is the energy represented by the mass defect between the parent and daughter nuclei minus the energy of recoil of the daughter nucleus when the beta particle is emitted That beta particles show a continuous distribution of energy is of importance in considering their radiation dangers

Even if the neutrino postulate had been unnecessary for explaining the beta particle spectrum it would have been necessary if spin energy is to be conserved in the above action Neutrons protons and electrons have spin quanta of $+\frac{1}{2}$ or $-\frac{1}{2}$ If the above neutron has a spin quantum of say $+\frac{1}{2}$ and the proton and electron are given quanta of $+\frac{1}{2}$ or $-\frac{1}{2}$ the equation does not balance unless the neutrino is added and given the appropriate spin quantum to make it balance

What has been said about the beta particles above applies equally to the positrons and hence when the proton changes to a neutron the neutrino must be also present according to the equation

	Proton	→	Neutron	+ positron	+ neutrino
Mass	1		1	0	0
Charge	+		0	+	0

There is some experimental evidence for the presence of neutrinos

A stable isotope having a neutron-proton ratio less than the stable one can achieve its neutron to proton ratio is by the emission of alpha particles Although these contain equal numbers of protons and neutrons the number of protons is usually less than the number of neutrons particularly in the heavy nuclei the loss of the alpha particle affects proton number relatively more than it affects neutron number and hence the ratio is increased

A further factor affecting the stability of nuclei is the number of protons and of neutrons Surveying the field of stable isotopes 164 have even numbers of protons and neutrons 55 have nuclei with an even number of protons and odd number of neutrons 50 have an odd number of protons and an even number of neutrons but only four have an odd number of protons and an odd number of neutrons These are ${}_1D^2$ ${}_3Li^6$ ${}_5B^{10}$ and ${}_7N^{14}$ It would appear that stability is affected by the possibility of proton and neutron pairing and is concerned with spin energies a proton and neutron give a stable pair when they are spinning in the same direction, as in the dueterons It can also be shown that the greatest stability is to be expected when the proton and neutron numbers are not only even but equal Such a state of affairs occurs with ${}_2He^4$ ${}_6C^{12}$ and ${}_8O^{16}$ and this may well account for the exceptional position these nuclides have in the graph of binding energy against mass number The greater stability would be expected to result from a greater release of energy on the formation of the nucleus i e on a greater binding energy

The next element above nitrogen having an odd number of protons is Fluorine with an atomic number of 9 It would be expected that the isotope ${}_9F^{18}$ would be stable as there would be equal numbers of protons and neutrons to permit pairing However the 9 protons produce too much mutual electro static repulsion to permit the stability to exist and hence another neutron is added to give the stability of the normal fluorine—${}_9F^{19}$ In odd odd nuclei having unequal numbers of protons and neutrons, the unpaired nucleons must be unable to pair owing to being in different states within the nucleus If the extra neutron were to become a proton by beta emission or the proton were to be replaced by a neutron by positron emission or K capture the nucleus would become of the even even type and be stable Hence odd odd nuclei of Mass number greater than 14 are radioactive being either beta emitters or positron emitters depending on their neutron to proton ratios

Although the structure of the nucleus is not known exactly there are three models by which experimental results are explained The first of these models is the liquid drop model in which the nucleons in the nucleus inter-act strongly with each other as do the molecules in a drop of liquid Hence any excess energy possessed by one nucleon would be rapidly shared by all the nucleons present The energy states of the nucleus are thus regarded as quantum states of the whole nucleus and not just part of it This model enables an explanation of binding energies and the existence of isobars—nuclides of the same mass number but different atomic number such as ${}_{30}Zn^{80}$ and ${}_{29}Cu^{80}$—to be made The liquid drop model also gives some explanation of the phenomena associated with nuclear fission but it does not offer any help in explaining the exceptional stability of certain nuclei having particular numbers of protons and neutrons These numbers are 2 8 20 50 82 and 126 and for want of a better explanation are called " magic numbers Some aspects of such nuclei are

(a) Elements having the greatest numbers of stable isotopes have 20 or 50 protons or 20 50 or 82 neutrons, such as tin of atomic number 50 which has ten stable isotopes

(b) Isotopes having magic numbers of neutrons appear to be very loathe to add to their neutron number by capturing neutrons they are said to have a small cross-section for neutron capture In this connection the unusual property of neutron emission possessed by only slightly excited nuclei of $_8O^{17}$ $_{36}Kr^{87}$ and $_{54}Xe^{137}$ is to be noted These nuclei have 1 neutron in excess of a magic number

(c) When by alpha particle emission a nuclide gives rise to another nuclide having a magic number of protons or neutrons or both, the energy of the alpha particle is particularly high It is found as corollary to this that the alpha particle energy is low when the emitting nucleus has magic numbers

(d) When a neutron is added to a nucleus to give a magic number the binding energy is very high

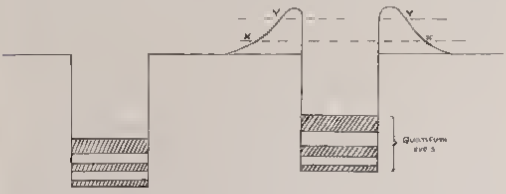
(e) The total binding energy as measured from mass defect is greater than that calculated from an equation which fits other nuclei when the nucleus is in the magic number category

To attempt to explain the phenomenon of magic numbers the Nuclear shell model has been invoked This model suggests that the forces between nucleons are small and that the nucleons are arranged in closed shells in a similar way to the orbital electrons It has been possible by assigning quantum values to spin orbital angular momentum etc, of the neutrons and protons to derive the maximum number of neutrons and protons that a given nuclear shell can hold These numbers agree with the magic numbers It thus seems that when the shells are full the nucleus is in a 'ground' state as regards its intrinsic energy and it is then 'extra' stable, so to speak The theory can be regarded as parallel with the theory of Bohr which puts the extra nuclear electrons into closed energy shells as described in the first article Although the nuclear shell model does explain some facts particularly concerning the spin of nuclei it does not explain all the experimental data of nuclei

The third nuclear model is called the collective model and it adopts certain points of both the liquid drop and nuclear shell models The full explanation of the models mentioned is considered to be out of place here, but mention has been made to them now in order to explain certain aspects of radioactivity that will be dealt with later

One further aspect of nuclear structure that is important to us is the potential barrier surrounding the nucleus Briefly this may be explained as follows If a positively charged particle is approaching the nucleus it will be repelled by the latter the value of the repulsive force being equal to the product of the charge on the particle and that on the nucleus The force also varies inversely with the square of the distance between the particle and the nucleus This being so means that the particle will be slowed down as it approaches, its kinetic energy being changed into potential energy in the electrostatic field between the two charges If the particle has only a small or moderate amount of kinetic energy this may be insufficient for the particle to come close to the nucleus As it moves away the potential energy of the field is now reconverted to kinetic energy If the kinetic energy is large enough the particle

[illegible] now instead [illegible] repulsion between the protons and the [illegible] there is attraction and the particle enters the nucleus with the liberation of binding energy A simple picture of this is to regard the nucleus as a small volcano with a central crater and sides that get steeper and steeper the nearer the top is approached If the particle has sufficient energy to get up the sides it drops into the crater amongst the other nucleons there These are thought to be in various energy states and the entry of the particle amongst them increases their energy If the energy of one or more becomes big enough escape out of the crater becomes possible



Representation for a neutron Representation for a proton

From the diagram it will be seen that for a neutron no barrier exists because or the absence of charge on the neutron For an alpha particle the barrier will be larger than for a proton since the alpha particle carries two positive charges To account for the facts of particle emission from nuclei the barrier is not considered as solid but as a penetrable barrier of different probabilities of penetration Thus at XX the probability of penetration is less than at YY Thus if a particle has only sufficient energy to reach the XX level the chances of its entry or escape are not as great as they would be if it had that much more energy to reach the YY level

It will be appreciated that once a particle is in the crater it still has the barrier to surmount if it is to escape—for escaping neutrons there is no potential barrier to overcome If the escaping particle has a large amount of energy—enough to reach the YY level—its chances of escape are good and hence those nuclei that readily emit particles i e have short lives will emit higher energy particles than those that do not emit readily i e , do not give particles having the energy to reach the YY level or above There thus appears to be some connection between the energy of the emitted particles, and the rate at which a nucleus gives off radioactive particles or radiation

Soddy and Rutherford investigated the rate of radiation and found that it fell off exponentially with time i e that as time progresses the rate of radiation gets smaller and smaller This suggests that the rate at which nuclei break down in any given sample of radioactive material at any given instant of time is proportional to the number of radioactive nuclei present at the time If N is the number of nuclei of a radioactive nuclide present at time t the rate of change of N with time can be expressed by the

mathematical notation $\frac{dN}{dt}$. Soddy and Rutherford showed that $\frac{dN}{dt} = -kN$ where k is the constant of proportionality between the rate of change of N (i.e. rate of radiation) and the value of N at any given instant; the minus sign shows that the value of $\frac{dN}{dt}$ is decreasing with time. The meaning attached to k can be appreciated by dividing both sides of the above equation by N and re-arranging the symbols to get $\frac{dN}{N}\frac{1}{dt} = -k$; i.e. the fraction of N $\left(\frac{dN}{N}\right)$ breaking down in a very short time interval dt, is constant for the particular species of nucleus being considered. If the fraction breaking down in the infinitesimally short time, dt, is large then the rate of radiation is high and it should not be long before the amount of radioactive material present has shrunk to very small amounts. It will of course be appreciated that as the amount decreases the rate of decrease falls off; this is the essence of an exponential change. k would in this case be of high value and it is called the decay constant. Its value indicates the probability of breakdown in any given time interval. If, for example, $k = \frac{1}{2}$ then one quarter of the nuclei present at a time t will have broken down in the very short time interval dt in the neighbourhood of t. In the next interval dt a quarter of those left will have broken down and so on.

Rutherford introduced another constant to indicate the rate of breakdown—the Half Life Period T. This is the time interval from any given moment for the radioactivity measured at that moment to decrease to half its value. Alternatively it is the time taken for half of the nuclei present at a given instant to be broken down by radioactive change. T is related to k by the equation $T = \frac{0{\cdot}693}{k}$ and in determining the half life periods of those nuclides having T of moderate values the value of k is first determined by experiment and then T is found from the equation. As every radioactive nuclide has its own particular value of T by which it can be identified the determination of T by experiment is of importance. As has been implied above the shorter the value of T the more active is the radiation source and the more penetrating the radiation.

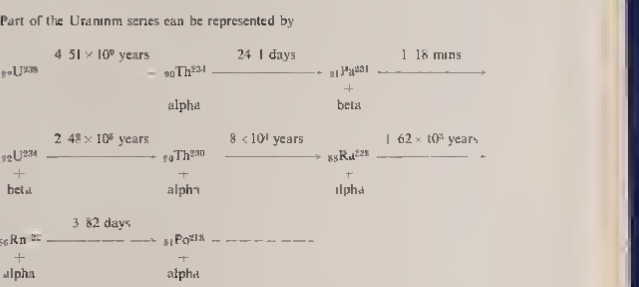
The following Table gives some idea of the values T can have and also shows the connection between T and the energy of the alpha particle emitted as well as its range in air.

Nuclide	*Range*	*Half Life*	*Energy (Mev)*
Thorium^{232}	2·8 cms	$1{\cdot}39 \times 10^{10}$ yrs	3·98
Radium^{226}	3·3 cms	1622 years	4·79
Radiothorium^{228}	3·9 cms	1·9 years	5·338+
Polonium^{218}	4·6 cms	3·05 mins	5·998
Polonium^{216}	5·6 cms	0·158 secs	6·774
Polonium^{214}	8·6 cms	$2{\cdot}6 \times 10^{-7}$ secs	8·776

It is considered that the naturally radioactive nuclides fall into three main groups each group consisting of a series of elements. The first nuclide in the series gives rise

by radioactive decay to the second in the series which in turn gives rise to the third and so on The three series are called the Thorium Uranium and Actinium series The last member of each series is a stable isotope of lead There is possibly a fourth series—the Neptunium series—which is supposed to start with one of the elements of atomic number greater than Uranium such as Plutonium ($_{94}Pu^{241}$) and end with a stable isotope of Bismuth $_{83}Bi^{209}$ As Plutonium and the other trans-uranic elements in the series have half lives whose values are small in comparison with the probable age of the earth they no longer exist naturally in any measurable amounts

Part of the Uranium series can be represented by



Suppose now that we consider two members of such a series If at a given instant we had N_A nuclei of the parent nuclide A and no other nuclei we know that the rate of breakdown of the nuclei is proportional to N_A This means that the rate of formation of the daughter nuclide B is also proportional to N_A initially As time progresses however the rate of breakdown of A and the rate of building up of B decreases If B is also radioactive it breaks down as it is formed At first the amount of B is very small and so the rate of its breakdown is also very small but as the rate of its formation is high the amount of B increases As it does so the rate of its breakdown increases Eventually an equilibrium position is reached when as much B is broken down as is built up in the same short time interval Putting this mathematically if k is the decay constant of A nuclide which has N_1 nuclei at the equilibrium position (assuming N_1 to be constant over many years if A is the first of the series and has a very long half life), the rate of its breakdown and the rate of formation of B $= k_1N_1$ The rate of breakdown of B is equal to k_2N_2 where k_2 is the decay constant of B and N_2 is the number of nuclei present at the equilibrium condition At equilibrium $k_1N_1 = k_2N_2$

If the daughter element is also having a granddaughter element and so on it follows that an equilibrium condition will be set up in which $k_1N_1 = k_2N_2 = k_3N_3$ etc

From this it follows that if X and Y are any two members of a radioactive series then in equilibrium condition is achieved $k_X N_X = k_Y N_Y$ or $\frac{N_X}{N_Y} = \frac{k_Y}{k_X}$ = a constant

It follows from this that in a specimen containing the nuclides in equilibrium the proportions of the nuclides should be constant If these proportions are determined chemically or if the radiation rate for the specimen is determined and the value of k_X or k_Y is known then the value of the other decay constant can be found

It might be said in conclusion that experiment shows that the rate of radioactivity is in general unaffected by physical conditions or by the nature of the chemical combination in which the radioactive element finds itself This suggests that fundamentally radioactivity is a nuclear phenomenon

(To be continued)

Clinical Notes and Cases

AN INTERESTING CASE OF "BEHÇET'S SYNDROME"

BY

Surgeon Commander J GLASS, R.N

THIS is a summary report of a rating who was seen at the sick bay H M S *Sea Eagle* Londonderry N Ireland and admitted to Military Hospital Waringfield Moira Co Down for investigation on 30th December 1960

Summary report by Lieutenant M Barry R A M C (Medical Specialist N Ireland Command)

T F F Naval Airman (Engine Fitter) total service six years nine months single age 25

' Admitted to Waringfield Military Hospital on 30 12 60

Fourteen days previously several small flat pink irritative spots developed on his glans penis disappearing two days later About five similar spots reappeared two days later and developed into pimples which grew these burst about *seven days ago* to form small craters some of which scabbed over while others have continued to get bigger and deeper becoming painful and discharging a clear fluid *Four days ago* he found his right ankle was painful to bear weight on and later this joint became swollen and reddened

No other joint symptoms

No ocular symptoms

No mouth ulcers

No rashes

Slight groin discomfort No swelling

No frequency dysuria or urethral discharge

Mild respiratory tract infection seven days ago

Anorexia and lethargic for seven days but otherwise no malaise

P H No serious illness V D denied

F H Father died of Sheffield Stone Grinder's Disease ' Nil relevant

S H Regular consort in Londonderry last contact three weeks previously She has subsequently been examined and declared healthy

Physical Examination

Febrile 99 F Looks unwell No pallor

Mouth healthy Skin normal No adenopathy

Eyes normal Warm slightly swollen tender right ankle joint with erythema of overlying skin Other joints normal

C V S Chest Abdomen C N S and *Fundi* all normal B P 140/80

Genital [illegible] destructive irregular non indurated and very tender ulceration of the penis [illegible] stitution to the coronal sulcus and glans, the largest 5 × 2·5 cm 1 cm deep Moderate penile œdema Scrotum healthy No significant inguinal adenopathy or tenderness No anal ulceration No urethral discharge

Investigations

Hb 108 per cent W C C 9 700/mm³ 70 per cent neutrophils
F S R 28 mm (West)
M S U normal
Chest X ray No abnormality apart from hilar calcification
Swab from penile ulcer grew Staph Pyogenes No Gonococci seen or isolated
Dark-ground examination negative for *Treponema pallidum*
G C F T —Negative
W R doubtful P P R & Kahn negative (on 31 12 60 and 5 2 61) Cold agglutination titre 1/4
A rising titre in influenza virus A from ½ to 1 was demonstrated Other respiratory viral serology normal

Progress

The association of massive necrotic penile ulceration with a swollen right ankle joint and in the absence of bubo formation suggested the diagnosis of 'Behçet's Syndrome' Venereal infection was excluded He was treated initially with tetracycline which reduced the secondary infection After three days however the ulcers were measurably larger and Prednisone 60 mgm daily was commenced Since then there has been a steady gradual healing by granulation re epithelialisation while the steriod dosage was progressively reduced Complete healing had occurred by 16 2 61 and Prednisone was discontinued on 22 2 61 There is some residual deformity of the glans due to scarring at the site of the ulcers but the urine flow is unimpeded Progress was complicated by a staphylococcal web space infection of the left hand which cleared rapidly with penicillin and incision under surface anæsthesia

Discharged on 23 2 61

Reviews

Clinical Gastro Enterology By F Avery Jones M D F R C P and J W P Gimmer M D F R C S Pp vii+652 with many illustrations Oxford Blackwell Scientific Publications Ltd Price 70s

This book is the first British textbook of gastro-enterology and is long past overdue We should have a particular interest in this book as one of the co authors is Consulting Gastro-enterologist to the Royal Navy

The main emphasis of the book is on diagnosis and management and will be of value to physicians surgeons and gastro-enterologists alike This is an authoritative textbook written from personal experience and based on the practice of gastro-enterology at the Central Middlesex Hospital where the special gastro-enterological unit is well known as a centre of teaching and research.

The book is well printed on good paper illustrated with X rays and neat diagrams of convenient size to handle and with a comprehensive index There are references to recent literature for further reading It is divided into 20 chapters and includes diseases of the appendix gallbladder liver and rectum these subjects being covered by other textbooks

The book begins with chapters on symptoms, functional disorders and motility—these are clear and based on personal observation the only criticism being several long lists useful for reference but too full to commit to memory These chapters are followed by those on volvulus congenital anomalies diverticulosis trauma vascular disorders tumours and hiatus hernia These are followed by the main digestive disorders—peptic ulcer gastro intestinal bleeding steatorrhoea regional and ulcerative colitis. Diseases of the pancreas peritoneum and miscellaneous disorders follow Thus all the main facets of gastro-enterological practice are covered in a most comprehensive manner The chapters for peritonitis recommendation are diseases of the pancreas ulcerative colitis Crohn's disease and gastro-intestinal haemorrhage Throughout the book one gains the impression as to how very necessary it is for the fullest co operation between physician and surgeon in gastro-enterological practice

Finally It is only necessary to say that this excellent work so badly needed will surely take its place amongst the other medical classics of our time

C W J U

Antisera Toxoids Vaccines and Tuberculins in Prophylaxis and Treatment By Parish and Cannon Fifth Edition Pp 258 45 photographs tables charts and illustrations Edinburgh and London E & S Livingstone Ltd Price 37s 6d plus 1s 3d postage

The title epitomises the contents of this book which describes briefly the preparation of Antisera Toxoids Vaccines and Tuberculins supplies prophylaxis and treatment of disease assesses their merits and demerits and discusses their keeping qualities and the best methods of handling them In addition the book contains much useful information on immunity tests and their interpretation the sterilization of syringes and needles the immunization requirements for international travellers and their documentation and personal medical records There is a short historical section and a comprehensive bibliography

The presentation is simple and straightforward and the approach essentially practical

This fifth edition is more than a modification of the fourth much has been rewritten parts of the contents of the fourth edition have been omitted and numerous additions mostly notably sections on Immunization schedules in childhood Immunization for international travellers and Personal medical records have been made

It is difficult not to describe this book as an indispensable part of the equipment of anyone practising preventive medicine certainly in the Services where preventive medicine is such an important part of medical practice knowledge of the greater part of the contents of this book is absolutely essential

P W E

Atlas and Manual of Dermatology and Venereology By Professor W Burckhardt Director Municipal Polyclinic for Skin and Venereal Diseases Zurich Switzerland Translated and Edited by Stephen Epstein M D Clinical Associate Professor of Dermatology University of Minnesota School of Medicine Minneapolis Pp xii + 276 99 colour plates and 75 black and white illustrations London Baillière Tindall & Cox Ltd Price 112s. Postage 2s 9d

Professor Burckhardt's Swiss Atlas has become so popular on the European Continent that within two years a second edition has been published With this English translation Doctor Epstein has now made it available for those without a working knowledge of the German language

It is [illegible] general practitioners and specialists [illegible] trainees [illegible] practices and their general [illegible] the [illegible] common diseases [illegible] 99 colour [illegible] illustrations [illegible] The quality of the illustrations is quite [illegible] three-dimensional in their effect. The text [illegible] appears adequate [illegible] has been done by an American [illegible] has been [illegible] B.P.C. and B.N.F. equivalents, the [illegible] proprietary drugs [illegible]

The [illegible] 1960 edition there should be no mention of Griseofulvin [illegible] should still be recommended for genital warts, and that radiotherapy should be [illegible] warts and malignant melanoma.

With all its limitations [illegible] magnificently produced book in a class of its own. Every Service medical officer should have a copy in his library. Let us hope that the price will not put him off.

R. S.

Sloan's Re-educative Treatment of Suppression Amblyopia. English Version by T. Keith Lyle, C.B.E., M.D., M.Ch., M.R.C.P., F.R.C.S., Cynthia Douthwaite, D.B.O., and Jill Wilkinson, D.B.O. Pp. xi + 135. Illustrated. Edinburgh and London: E. & S. Livingstone Ltd. Price 25s. Postage 1s. 6d.

The most serious sequel to a squint is suppression of vision in the squinting eye, which inhibition if unrelieved may result in serious and permanent visual impairment. An essential step in treatment is the early occlusion of the fixing eye supplemented by exercises of a progressive nature for the squinting eye. These procedures if begun at an early stage often result in marked visual improvement and in favourable cases binocular perception may be established with full stereoscopic vision.

This book consists of some 80 pages of graduated proof reading which are designed to encourage exact reading of every letter in each word with subsequent recording of the various deliberate mistakes which occur in the typescript, the printing of which begins in size N.18 gradually diminishing until N.5 is reached. Once central fixation has been restored, exercises are performed on an ingeniously constructed series of diagrams constructed with the intention of correcting disturbances in spatial localisation. These diagrams are interesting in themselves and are designed on the "What's wrong with this picture?" principle. The book is suitable for home exercises once the principles underlying its use and full practical instructions have been explained by the Orthoptist. It will prove of considerable service in Orthoptic Departments and copies are already being used with much benefit throughout the country—the system has been used in France for some years where it was introduced by its author Docteur Jean Sédan.

D. P. G.

Modern Treatment Year Book 1961. By Sir Cecil Wakeley, Bt., K.B.E., C.B., LL.D., M.Ch., D.Sc., F.R.C.S., F.R.S.E., F.R.S.A., F.A.C.S., F.R.A.C.S. Pp. 370. 32 plates. 10 illustrations. London: Baillière, Tindall & Cox Ltd. Price 35s. Postage 2s. 3d.

This book is designed primarily for the general practitioner rather than the specialist. As its title implies, it describes present day views on many of the conditions, acute and chronic, commonly encountered in general practice, and outlines their treatment.

The 31 chapters, each written by a different author expert, cover an extraordinary wide field. Thus there are included emergencies and chronic disorders in the fields of general surgery, orthopaedics, oto-rhino-laryngology, urology, gynaecology, obstetrics, general medicine, dermatology, psychiatry and ophthalmology.

The book is much more than a catalogue of the latest treatments. The various conditions discussed are described clearly and simply and many are excellently illustrated; the whole text makes surprisingly easy reading.

P. W. E.

Surgery of the Acute Abdomen. By John A. Shepherd, V.R.D., M.D., Ch.M.(St. And.), F.R.C.S.(Ed.), F.R.C.S.(Eng.), Q.H.S., Consultant General Surgeon, Liverpool; Formerly Lecturer in Surgery, University of Liverpool; Surgeon Captain, R.N.R. Pp. x + 728. 104 illustrations. Edinburgh and London: E. & S. Livingstone Ltd. Price £5.

Mr. Shepherd has presented us with a monumental work embracing every aspect of this important subject. Its great merit lies in the fact that it is the work of one author of wide practical experience, acute clinical perception and an ability to analyse accurately the significant features of almost 1,200 painstakingly recorded personal cases. It is more than this. It is an authoritative work of reference and both the Harvard system and chapter references, which are employed throughout, provide a most comprehensive survey of the relevant literature, while an historical note at the beginning of each chapter is both interesting and instructive. In fact, the arrangement of this book, its clear print broken by bold clarifying headings, combines with an easy literary style to make for pleasant reading, while clinical notes on personal cases have been carefully chosen to underline points which no purely academic dissertation would so emphasize. We learn, for instance, of a case of carcinoma of the stomach which first presented with retention of urine due to impaction of a cement-like mass in the rectum as the result of taking large quantities of bismuth powders.

In a book [illegible] with [illegible] pursued [illegible] and the [illegible]

While [illegible] would profit from [illegible] to the young [illegible] constantly [illegible] decisions to b[illegible] theatre. Differential [illegible] and many will appreciate the [illegible] classification of [illegible] conditions.

It would be [illegible] for [illegible] For instance [illegible] surprising that [illegible] in milligrams per [illegible] in milli-equivalents per litre that [illegible] suggested [illegible] of protein and that Ryle's tubes are still [illegible] the large [illegible] subjects of [illegible] find [illegible] of these [illegible] sions. On the whole, however, [illegible] of this work [illegible] heartily endorsing the [illegible] of Sir Zachary Cope who [illegible] is acknowledged [illegible] the realm of the acute abdomen. [illegible] which is so likely to be helpful to the [illegible] surgeon in deciding on the best treatment in any particular circumstance. The senior surgeon will also find much recent information which will help him to keep in touch with the latest advances in the subject.

The surgeons of the Royal Navy will particularly welcome Mr. Shepherd's book, for many know him as a Surgeon Captain of the Royal Naval Reserve with an active interest in the Royal Naval Medical Service. Not only are many of his illustrative cases [illegible] but space is also given to the management of the acute abdomen at sea which, as many of us have emphasised, should be essentially conservative except in those circumstances where, as Mr. Shepherd puts it, there is no alternative to courageous surgical intervention.

Mr. Shepherd is to be congratulated upon a most detailed and comprehensive survey of the problems presented by the acute abdomen and his book is likely to become the standard work on this subject.

J. W.

We acknowledge with thanks receipt of the following publications

Acta Medica et Biologica. Annales Medicinae Internae Fenniae. Annali Di Medicina Navale e Tropicale. Annals of Tropical Medicine and Parasitology. British Medical Journal. British Medical Bulletin. B.S.I. News. Guy's Hospital Gazette. International Review of the Army, Navy and Air Force Medical Services. Journal of the Royal Army Medical Corps. Le Médecin de Réserve. Medicine [illegible] Medical Digest. Middlesex Hospital Journal. Military Medicine. [illegible] Medical Journal. N.A.A.F.I. [illegible] Journal of Medical Science. Proceedings of the Staff Meetings of The Mayo Clinic. Revista Di Medicina Aeronautica E Spaziale. [illegible] St. Mary's Hospital Gazette. St. Thomas's Hospital Gazette. The Australian Journal of Experimental Biology and Medical Science. The British Journal of Surgery. The [illegible] Journal of Medical Sciences. The Journal of the [illegible] Graduate School of Medicine. The Journal of The [illegible] Medical Association. The [illegible] Medical Journal. The Medical Press. The Tohoku Journal of Experimental Medicine. The Ulster Medical Journal. Tropical Diseases Bulletin. University of Birmingham Research Committee [illegible] Westminster Hospital Gazette. The [illegible] World Health Organisation Bulletin. Yokohama Medical Bulletin.

News of the Services

OBITUARY

Surgeon Captain F C HUNOT died on the 15th April 1961 at the age of 73

Surgeon Captain Hunot qualified M R C S (Eng) L R C P (Lond) in 1913 and he entered the Royal Naval Medical Service on the 3rd April 1914 as a Surgeon Lieutenant He was promoted Surgeon Lieutenant Commander on the 3rd April 1920 Surgeon Commander on 1st February 1927 and was placed on the Retired list at his own request with the rank of Surgeon Captain on the 15th April 1935

Surgeon Captain Hunot was re-appointed on 28th September 1938 and served during the Second World War until he was released on the 16th February 1945

M R G writes —

I cannot let the death of Surgeon Captain Hunot pass without a tribute to that much beloved officer I first met him early in 1940 when he was Medical Officer in Charge of H M Hospital Ship *Patna* and he was to be my P M O for the next 2½ years We were a motley gang reserve doctors ships officers, nursing sisters a paymaster fresh from a London store a Dentist from a chocolate factory and a Padre from Canada The war news was that of unrelieved gloom climatic conditions were often trying and our time alternated between complete boredom and feverish activity Through out this period Surgeon Captain Hunot's influence can hardly be overstressed He had no enemies in fact I doubt if he even had a mess word with anyone in the ship but his word was law he was respected and if I may use the word actually loved by us all

There was an absolute integrity of character which was perhaps his outstanding feature there was a genuine kindliness combined with a highly sensitive nature and there was abundant common sense three attributes which made him an ideal leader

After leaving the hospital ship he went to R N Hospital Haslar as Officer-in-Charge of the Surgical Division during the most critical period of the war Including the Normandy landings and again he kept together an efficient and happy team during those trying days How often did we remark to each other that we were fortunate indeed in having Surgeon Captain Hunot as our P M O

Surgeon Captain James Cecil KELLY died on 21st April 1961 He was born on the 5th January 1888

Surgeon Captain Kelly qualified M D B S in 1913 He entered the Royal Navy as a Surgeon Lieutenant on the 3rd April 1914 He was promoted Surgeon Lieutenant Commander on the 3rd April 1920 and Surgeon Commander on the 3rd April 1926

He was placed on the Retired list on the 5th January 1943 with the rank of Surgeon Captain and was re-appointed (to serve in the rank of Surgeon Commander) until he was released on 7th February 1947

Surgeon Captain Kelly was awarded the Distinguished Service Cross on 21st September 1917 (*London Gazette*) whilst attending wounded under fire

Surgeon Captain J C SOUTER R N died on the 3rd May 1961 Born on the 4th August 1899 he qualified M B Ch B University of Aberdeen in 1921

Surgeon Captain Souter entered the Royal Naval Medical Service as a Surgeon Lieutenant on the 22nd February 1925 He was promoted Surgeon Lieutenant Commander on 22nd February 1931 Surgeon Commander on 22nd February 1936 and Surgeon Captain on the 31st December 1944

Surgeon Captain Souter was awarded the Gilbert Blane Medal in 1941 He was presented by the King of Norway with the "King Haakon VII Liberty Cross"—*London Gazette* 28th February 1947

He was placed on the Retired list (medically unfit) on the 7th June 1950

HIGHER DEGREES

F R C P (London)—Surgeon Captain F P Ellis
F D S, R C S (Eng.)—Surgeon Lieutenant (D) A J Chapman
M R C O G—Surgeon Lieutenant D C Beckingham
M R C P—Surgeon Lieutenant G J Milton-Thompson
D C H—Surgeon Lieutenant J T Harries
D R.C O G—Surgeon Lieutenant J F Steele-Perkins

PROMOTIONS

To Surgeon Rear Admiral—D D Steele Perkins *C V O* F R A C S D L O
To Surgeon Captain—C D Coode and H G Silvester
To Surgeon Commander—D O Haines and T S Law
To Surgeon Commander (D)—A F J Smith
To Surgeon Lieutenant Commanders—J R Lawrence-Owen A F Davidson R. J W Lambert
To Surgeon Lieutenant Commander (D)—P H Tucker

TRANSFERS TO THE PERMANENT LIST

Surgeon Lieutenants D W D Evans R L Owen J C Twomey P J Banfield Surgeon Lieutenant (D) G C Salmon

ENTRIES FOR SHORT SERVICE COMMISSIONS

P G Odgers (Re-entered)—I P Burgess Watson S N Russell L O.S. G P Hollings L.D S

RETIREMENTS

Surgeon Rear Admiral D F Walsh
Surgeon Captain T G H Crawford A Long C J P Pearson G D Weald
Surgeon Commander E S Elliott G J Fobs

WARDMASTER OFFICERS

PROMOTIONS

Promoted Acting Wardmaster Sub Lieutenant—S Grundy

RETIREMENTS

Wardmaster Lieutenant Commander S C Knight

QUEEN ALEXANDRA'S ROYAL NAVAL NURSING SERVICE

PROMOTIONS

To Matron—Miss M E Myres, *A R R C*
To Superintending Sister—Misses P M Wilk J Harworth M A M Paterson
To Senior Nursing Sister—Misses C M Mellis A M McMichael E V Wade V M Carter (re-entered)

TRANSFERS TO THE PERMANENT LIST

Miss S M Hayes Senior Nursing Sister

TRANSFER TO SHORT SERVICE

Misses P R Hennell E H Grantham E V Wade Senior Nursing Sisters

ENTRIES FOR SHORT SERVICE

Miss C Conison M White R E C Bramfoot

R N R OFFICERS

HONOURS AND AWARDS

Queen's Honorary Surgeon—Surgeon Captain F de B Tuttle *V R D* R N R

NAVAL MEDICAL COMPASSIONATE FUND

ACCOUNT OF RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31st DECEMBER 1960

	£ s d	£ s d
Balance at Bank on 31st December 1959		
Current Account	524 16 2	
Deposit Account	584 15 9	
		1 109 11 11
Dividend on 2½% Consolidated Stock	265 0 0	
Interest on 3½% Conversion Stock	86 10 0	
Interest on 4% Consolidated Stock	40 0 0	
Interest on 3½% War Stock	35 0 0	
Interest on 4½% British Electricity Stock 1974/1979	71 14 0	
Interest on 3½% Funding Loan 1999/2004	24 19 8	
Interest on 4½% Conversion Stock 1964	68 18 1	
		572 1 9
Refund of Income Tax on Deeds of Covenant		108 18 2
Interest on Deposit Account		12 13 5
Subscriptions		240 9 0
Donations		4 0 0
Sale of £10 600 2½% Consolidated Stock	4 795 13 2	
Sale of £1 687 5s 1d 4½% British Electricity Stock 1974/79	1,361 7 0	
Sale of £713 16s 10d 3½% Funding Loan 1999/2004	455 17 4	
		6 602 18 6
		£8 650 17 4

	£ s d	£ s d
Awards to Widows and Orphans		330 0 0
Clerical Assistance		30 0 0
Auditor		3 3 0
Inland Revenue Stamp on Deeds of Covenant		1 1 0
Printing of 100 Booklets		6 0 0
Stationery and Postage		4 5 0
Purchase of £3 498 3s 2d 4% Consolidated Stock	2 363 16 10	
Purchase of £5 000 4½% Conversion Stock 1964	4 823 17 5	
		7 187 14 3
Balance at Bank on 31st December 1960		
Deposit Account	12 13 5	
Current Account	1 087 1 —	
		1 099 14 5
		£8 650 17 4

I certify that I have examined the above Account of Receipts and Payments and found it to be correct and in accordance with the books and records of the Fund and that all my requirements as Auditor have been met.

A certificate of the Balances on Current and Deposit Accounts at the National Provincial Bank Limited on 31st December 1960 is attached together with a list of Stocks standing in the names of the Trustees for which Stock Certificates were held by the National Provincial Bank Limited for safe custody.

Income Tax amounting to £43 11s 11d deducted from Interest on 4½% Conversion Stock 1964 received during the year is recoverable from Inland Revenue.

Subscriptions unpaid at 31st December 1960 amounting to £8 8s 0d as follows —

1958	£1 1 0
1959	£3 3 0
1960	£4 4 0
	£8 8 0

(Sgd.) W. S. C. McNICOL, Chartered Accountant
Auditor

24th April 1961

In addition to the above Cash Balance, Stock to the following amounts were standing at the close of Accounts at the Bank of England in the names of the Trustees —

£4 498 3s 2d	4% Consolidated Stock
£1 000	3½% War Stock.
£1 900	3½% Conversion Stock
£5 000	4½% Conversion Stock 1964

(Sgd.) W. P. McINTYRE
Surgeon Rear Admiral
Honorary Treasurer

23rd January 1961

ADMIRALTY FLEET ORDERS—1961

(This page is perforated for filing purposes)

2 —Passages—Naval Personnel—Travel at Public Expense for Families, School-children's visits, Servants and Children's Nurses or Governesses

15 —Allowances for Children at Boarding Schools

26 – Survival Training

27 —Naval Officers– Gold Laced Trousers.

28 – Medical—Morphia—Use in Ships Not Carrying a Medical Officer

93 —Life Saving—Volunteers

95 —Medical– R A F) Medical Rehabilitation Units

196 —Medical—Royal Naval Bulletin No 11—Distribution

197 —Medical —Thiopentone Injection B P

319 – Casualties to Service Personnel– Official Visits to Widows of Officers

324 —Medical—Muster of Medical Envelopes (F Med 4) Pulheem Assessments – Vaccination and Inoculations

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(The Admiralty does not accept responsibility for the opinions expressed in this Journal)

EDITED BY
THE STAFF OF THE ROYAL NAVAL MEDICAL SCHOOL
ALVERSTOKE HANTS

Articles

PART III. A CONCISE TREATISE ON MARINE SCIENCE

Chapter II—Oceanography

Waves, Tides and Currents

By Surgeon Commander J GLASS R N

Waves

For millions of years waves running ahead of storms have given the warning of these events Folk lore has been the means of interpretation in the past of such early signs of climatic upheavals At present wave recorders strategically placed can tell all that is required to be known of disturbances arising at isolated storm centres thousands of miles away where there are no meteorological stations or observing aircraft or ships in transit to relay such information

Forecasts of the state of sea and height of surf waves was of paramount importance to beach landings operational planners of the last Great War, and necessity gave impetus to the study of this formerly neglected aspect of oceanography It was stated by a planning staff naval officer at the time that there was a serious lack of basic information on the strategic fundamentals of the science of the sea (Carson, 1956) The success of amphibious operations was dependent on this knowledge

Professor Sverdrup s forecast of heights and lengths of waves assisted beach commanders at the North African landings Admiralty set up a Swell Forecasting Section to function in a similar manner for the planned D-Day operations on the French Coast

A sea wave follows the physical law applicable to all forms of wave motion and progression

The special terms arising through sea wave activity are nautical and regarded universally by all who deal with ocean matters The period of a wave is the time required for succeeding crests of a wave to pass a fixed point

All factors concerning waves are rarely static and are relative to wind and depth of water atmospheric conditions the length of fetch ' currents and tidal changes of the coasts under scrutiny at the time The fetch is important as it defines the distance a wave can run under the driving wind in one direction without interference Large waves cannot form in the small space of a bay or other small body of water A fetch of 600 to 900 miles is the length required under gale conditions to produce the really huge ocean waves

The water that forms the wave does not advance with it across the sea Each water particle describes a circular or elliptical orbit with the passage of the wave form and returns approximately to its original position If this was not so and did not

obey the physical laws of wave motion a huge mass of wave water would be charging up and down the oceans making it practically impossible to navigate

Waves build up when influenced by a constant wind and as the storm accelerates the waves take up the energy of the wind and grow in height as the gale is absorbed However when a wave grows in height up to approximately one seventh the height from trough to crest in relation to the distance to the next crest whereby one seventh the pitch is relative to one wave length the wave begins to topple in foaming white caps

A typhoon will often blow the top off waves and higher waves can develop after the wind subsides

Recently formed waves have a steep peaked shape. High roaring waves with a crest forming all along on an advancing front and curling forward to plunge into a trough or onto the shore have storm origins a great distance away

Early investigations into the science of hydrodynamics were made by Thomas Stevenson his famous son Robert Louis Kelvin Helmholtz and more recently Vaughan Cornish who checked the values of length and period of waves and the link between speed of waves and winds that generated them The study of systematic wave spectra and graphical presentation by Barber and Ursell led them to calculate to a high degree of accuracy the distance there was from the origin of a storm centre to their recording station basing the assumption on the results of a sensitive pressure wave measuring instrument that waves of different period travel entirely independently after leaving the storm area (Darbyshire 1959)

In 1952 M J Tucker of the National Institute of Oceanography designed a ship borne wave-recorder a modified pressure measuring unit fixed amidships to a ship's hull about ten feet below the water line The readings were corrected for the ship's movement taken on the accelerometer which measured the rate of the ship's motion upward or downward and dynamics effects were allowed for to finalise accuracy of the wave record obtained

Similar apparatus has been in use in the Royal Research Ship *Discovery II* since 1952 and in ocean weather ships shortly after

Darbyshire (1959) stated that "just as irregular parallel crested waves can be thought of as a whole series of regular waves of different periods in combination so the short crested waves can be broken down into a collection of simple waves of various heights and periods moving in different directions The problem of producing an energy spectrum is now much more difficult because we have to find the energy content in waves of a given period moving in a given direction This involves a more elaborate system of wave measurements

The hypothesis of waves broken down into simple components of different periods has been extended to ship motion by Darbyshire (1959) to assume that these simple waves can affect the ship independently

New ship model basins at Feltham and Haslar in U K the Taylor Model Basin in U S A and the basin at Wageningen Holland are designed for ship behaviour tests in simple and complicated waves The Dutch model can generate the long crested simple waves as well as the short crested the more complicated two dimensional variety

Barber in New Zealand used two detectors [illegible] wave length apart to determine how much the wave is in advance [illegible] over the other' The electrical output of the two recorders arranged [illegible] resulted in a complete two-dimensional spectrum Other recording meth[illegible] similar in principle but more involved require calculations by digital computers

An American project SWOP the Stereo Wave Observation Project used stereo photographs of wave surface superimposed on grid lines and produced results after a very lengthy calculation period

A method developed at the National Institute of Oceanography using the idea of a free floating buoy which carries a vertical accelerometer and two gyroscopes was used by Longuet Higgins and Cartwright on *Discovery II* Calculations again were given on a two dimensional spectrum

The practical applications for this work have a bearing on the design of harbour installations breakwaters undersea oil well drilling and the plotting of quiet shipping lanes (Derbyshire 1959)

Waves higher than 25 feet from trough to crest are rare Mariners have described however storm waves of 60 feet in height One wave was seen by those in a U S Naval vessel on a passage from Manila to San Diego in February 1933 and a calculation of 112 feet was noted as the wave height, while a gale at the time was at its fiercest The vessel had a following wind and sea

A recent high recorded wave height was that measured at the weather ship station *India* at 61° 00 N., 15° 20 W on 26th November 1956 of a wave 60 feet from crest to trough

Ray and Champi (1958) quote Barnett who calculated that it would take a 60 mile an hour gale blowing steadily in one direction for a distance of 900 miles to produce a 40-foot high wave Since such conditions are not often met with such waves are unusual and the breaking wave force would be tremendous It has been stated that some huge waves can strike with a force calculated at three tons per square foot

The fiercest waves beat against the Shetland and Orkney shores They have their tumultuous origins in the cradle of cyclonic storms which arise and travel east from the area between Iceland and the British Isles

The generative processes by which winds form waves and the study of wave measurement has led to the development of empirical formulæ allowing reasonable forecasts of wave activity The meteorological chart forecast the basis of wave condition forecasts has given results to approximately 20 per cent accuracy under deep sea conditions As the sea becomes shallower and the waves become modified by shoaling bottoms and tidal streams the readings are less accurate (Tucker 1959)

Tidal waves are of two distinctive types One a *seismic* wave formed from some undersea upheaving earthquake The other follows on an exceptionally high wind or *storm wave*—which rises on shore far above the normal high water line.

Seismic waves called tsunamis arise from the deep trenches of the ocean floor products of earthquakes The earth's crust in certain areas is under great strain particularly off Japan the Philippines West and South America and Portugal The first three areas produce most of the underwater earthquakes which take place

When a large earthqnake occurs deep below the ocean waters a sharp wave of movement is transmitted which first travels upwards then outwards in all directions and crosses the ocean with great speed The rate of travel of such a wave is such that when a "quake" off the north coast of Chile was reported it reached the other end of Chile in five hours then crossed to Honolulu in 12 hours 37 minutes and reached New Zealnnd in 19 hours 18 minutes—a speed recorded at places from 282 to 454 miles an hour whilst the radius of action was more than 7 000 miles (Smith 1939)

Seismograph stations are widely scattered and one function is to offer a warning system for seafront evacuation of inhabitants to prevent loss of life which formerly took place by the rising thundering walls of tidal waves following major disturbances of the deep sea floor

Early in the morning of Snnday 22nd May 1960 it was reported from Chile that a series of severe earthquakes devastated the city of Concepcion in the Puerto Montt area of Southern Chile This occurrence was the fourth disastrous earthquake Chile experienced this century

Jnst after midnight on the 22nd Mav a report from the Hawaiian Islands stated that a series of four huge waves struck the main island the eastern most of the chain where the town of Hilo was innndated

From New Zealand news came that heavy waves swept the east coast beaches of North Island on Monday 23rd Mny and that before dawn on Tuesday 24th May tidal waves estimated at 30 feet high swept the coast of Japan The city of Shrangawa. Northern Japan was apparently the worst affected Press reports stated that tidal wave warnings were twice given in the district the day before but that little notice was taken because of "inexperience"

Sea disturbances of varying intensity of violance have since been reported from Polynesia the Philippines and Formosa and it has been estimated that the forceful shock waves travelled 9 000 miles across the Pacific at a rate of over 400 miles an hour

The waves of the depths of the sea were known to Scandinavian hydrographers in the early 1900 s Jnt the means of stndying them are only recent advances in marine science These deep water disturbances are ocean wide and the waves are strong enough to roll snbmarines about The submarine waves break against the Gulf Stream—and some of the water masses involved occur between layers of dissimilar water and can reach a height of wave movement up to 300 feet The affects of these gigantic move ments have yet to be studied for the influences it varying depths at various places and on different fanna and flora

Tides

From earliest days tidal movements have been plotted and speculations arose because of the coincidental changes with the phases of the moon and were sources of philosophical conjecture

When the Laws of Motion were expounded by Sir Isaac Newton the mathematical appreciation of tides became possible and the first Admiralty tide tables appeared in 1833, which gave predictions for four ports

Tides then basically the result of gravitational pull of sun and moon on the

mobile water mass which cannot be resisted cause a wave whose length equals half the world s circumference and which travels across the open ocean at approximately 650 knots an hour

The sun although so much more massive in comparison with the moon does not have so strong a tide generating force

The answer s that while the force is directly proportional to the mass of the sun it is is well inversely proportional to the cube of the distance away Thus the sun with a mass of 330 000 times that of the earth is 93 000 000 miles away compared with the moon whose mass is 1/81 of the earth which is 240 000 miles away The result is that the force exerted by the sun is slightly less than half that exerted by the moon When the combined action of the sun and moon is exerted, as the sun earth and moon are in line at a new or full moon phase the tidal effect reinforces one another and the spring tides result When the sun and moon are in quadrature in relation to the earth the tidal effects are in opposition and "neap" tides occur Other influencing factors complicating the sequence of tides are the variations in distance and declination of the moon and the corresponding alteration of the earth in relation to the sun

By theory as the moon passes across the meridian of the earth there should be a high tide with a second high tide at its antipodes At the same time the theoretical meridian of low water should occur midway between these two points

However under various circumstances high water at any particular port does not necessarily occur when the moon crosses its meridian and if there is a difference it is always constant for that particular place, i e London has a difference of two hours high water occurs two hours after the moon crosses the Greenwich Meridian This time lag difference the establishment of the Port ' is a fairly stable feature of tides in any particular area of the world

Tides too are about 50 5 minutes later everywhere each day because the lunar day is 24 hours 50 minutes and 32 seconds When the tidal wave passes across deep open water the mid oceans merely heave gently two or three feet As the wave nears shallower waters near shore friction retards the speed of the lower part so that the upper portion tends to rise and topple forward In confined space channels like the English Channel the water is piled high At Chepstow and the Bay of Fundy (Nova Scotia) the height of rising water the highest in the world is over 45 feet at each high tide

The range of tide the difference in height of rise and fall between high and low water varies regularly being greatest at spring tides which occur a day or two after the new and full moon and smallest at the two weekly cycle which follows a week later the neap tides which occur just after the first and third quarters of the moon s phases (Bowden 1959)

The tidal changes are more complicated however than celestial influences which vary constantly with the phases of the moon and with the distances involved between the moon and sun from earth and with the position of each north and south of the equator An additional factor is the ' period of oscillation which every body of water possesses Any water disturbed moves with an oscillation which is least in the centre and pronounced at the perimeter

[illegible] that the [illegible] body of water contains [illegible] [illegible] [illegible] period [illegible] determined by [illegible] the [illegible] [illegible] [illegible] the [illegible] [illegible] and sun and the kind of motion the period of swing of the water which is dependent on the actual dimensions of the basin The tides are thus affected oddly and is the explanation why in one locale the tides behave differently with little rise and fall in some places and vast differences at others whereby the time of high water each day could vary by as much as twelve hours at different places on the shores of the same bay Thus local topography i e slope of shelf depth of channel or width of entrance to bay determines the feature of actual rises and falls whilst the planets start the action off (Carson 1956)

The oscillation theory suggests that the waters rocking up and down in a natural basin about a central tideless node results in a small tidal range i e the centres of the Sea of Okhotsk at some points have rises of ten feet and the head of one arm the Gulf of Penjinsk the rise is 37 feet which is at the end of an oscillating basin

The immense movements of water in the Bay of Fundy results from a combination of circumstances The bay is at the end of an oscillating basin and the period of oscillation of the basin is about twelve hours This period nearly coincides with the period of the ocean tide, and when the two are added and support each other the water movement is thus increased and flows into the narrow and shallow upper reaches of the bay thus compelling a huge mass of water to crowd into a restricted area and contributes to the renowned Fundy tidal heights There are many oddities only explicable by this oscillation proposition

Tahiti waters appear to follow the influences of the sun rather than the moon With slight differences high tide occurs at noon and midnight and low water at 6 a m and 6 p m thus apparently ignoring the moon which should influence an advance of 50 minutes to the time of tides each day However if the island is considered to be at the axis or node of a basin set in oscillation by the moon then there is little motion at this point responding to the moon s influence and the water is free to move to a rhythm induced by the sun

For the accurate predictions of times and heights of high and low water which are essential to navigators and the business of modern ports a complete understanding of the dynamics of tides at every place is fortunately not required

The harmonic method of prediction is based on a principle by LaPlace who theorized that the tide at any place contains the same constituents as those occurring in the tide-generating forces The amplitude and phase of each constituent can be found from an analysis of recorded observations taken over a lengthy period This information combined with data on the constituents of the generating forces derived from astronomical tables is all that is required for long term predictions

Tide prediction machines based on original designs by Kelvin are complicated but fairly efficient provided meteorological effects are not severely abnormal In such cases the water level could be several feet higher or lower than the predicted level

One example of a storm surge was the catastrophic high tide of 31st January and the 1st February 1953 which caused such havoc by flooding the channel coast

of Britain and Holland The crest of such a storm surge [illegible] frictional stress of high wind on the water surface piles up water on the [illegible] tide (Bowden 1959)

In the past the tides were mightier than those of today in keeping with other aspects of precipitant and powerful violences to which this earth world was subjected

The moon's present orbit took some two thousand million years to resolve When its distance from earth was less its power was so much the greater in influencing tides which must have been tremendous After the centuries long deluge the mountainous surf possibly rolled twice a day hammering high cliffs and sweeping inland to erode mountain sides and then rush out in the formed gorges carving out valleys and river beds At that stage the landed earth would not be inhabited As millions of years passed and the moon receded the tides decreased and will continue to do so until they no longer exist in the distant future

Tidal friction is gradually slowing down the earth's rotation—even as the frictional movement of water over the ocean bottom and continental shelves and inland seas is gradually diminishing its force and power This retardation of axial spin will make the day longer and longer With this action taking place other factors emerge As the rotation of the earth slows that of the moon must accelerate and the centrifugal force will carry it further away As that body gets more distant its influence on tides will correspondingly decline Then as the moon takes longer to complete its earthly orbit there will come a day when the length of day and month coincide and the moon will cease to rotate the earth—at that phase of events there will no longer be tidal movements All this will take a very very long time as it is only a matter of seconds that our day has lengthened since Biblical times

The tides other than the mass movements of waters and its relation to navigators and future watchmakers has a great influence on the life of sea creatures A multitude of sessile animals owe their existence to the tides which bring them sustenance they cannot themselves seek Spawning and feeding habits of many sea inhabitants are linked with tides of the new moon and full moon phases at certain times of the year in different locales The perpetuation of many species is timed to a precise cycle of certain tidal movements which has developed over the passing of the many years

Currents

Maury (1880) emphasized in the introduction to his first edition that navigators of his time would greatly benefit if they all became observers of winds and currents of the sea and "other phenomena that relate to its safe navigation and physical geography" and made recordings of observations at sea according to a uniform plan Under the sponsorship of the U S Government who recognized that an international conference would stimulate this idea on a world wide basis of maritime states for the benefit of all representatives from France Great Britain Russia Sweden Norway Holland, Denmark Belgium and Portugal met in Brussels on 23rd August 1853 for this purpose

Shortly after that meeting Prussia Spain Sardinia the Holy See the free city of Hamburg the republics of Bremen Chile and the empires of Austria and Brazil

offered to co-operate to carry out one system of ' philosophical research ' with regard to the sea

Whatever their differences in politics and commerce the initial object to study the sea began in an atmosphere of goodwill

The base line for further investigation was the informative treatise by Maury

Of those who preceded him Maury noted an earlier oceanographer, Count Marsigli a Frenchman whose book Natural Description of the Seas translated into Dutch by Boerhaave in 1786 related to observations in the Mediterranean on the bottom and shape of the sea on components of sea water on movements of the sea water and on sea plants He also considered as an invaluable background to his own work the book by Rear Admiral W H Smyth K S F D C L The Mediterranean A Memoir Physical Historical and Nautical published by J W Parker and Son London 1854

Modern systematic studies since that time have provided the material for these notes

Currents have a complex origin and are of greater importance than waves and tides, although not so spectacular

The ocean currents appear to be permanent and there is a fairly steady pattern of movement of these currents As they are dependent on winds and the modifying influences of winds and the sun the eastern revolving of the earth and the obstructing continental masses there is no extraneous factor to cause a change, i e , the Gulf Stream is about 60 million years old

Prevailing winds in both hemispheres blow from east along the Equator—the Trade Winds and from the west along the horse latitudes " 30° north and south— the Westerlies The earth s rotation deflects these winds so that paths become circular—clockwise above the equator and counterclockwise below In the centre of these giant bodies of water are eddies where water circulates around and around Such an eddy is the Sargasso Sea

Tropical rains have an effect in diluting the surface water which produces complex current movement. On lee coasts of prevailing winds water is blown away from the shore and is replaced by upwelling water, floating up from the depths Conversely the windward coasts accumulate surface water which sinks The areas of upwelling show the greatest abundance of life to be found anywhere on earth The most abundant of all such areas seems to be off the coast of Peru and Northern Chile

The Major Ocean Currents

Firstly the North Atlantic oval circulation is formed by the water passing south east near the Azores and passing southwards along the Spanish Moroccan shores then takes a turn south west and west between the Tropic of Cancer and 10 N where it becomes the North Equatorial Current When it reaches South America it divides in two one branch going south past Brazil and the other north to the West Indies The northern branch divides into two, one part entering the Caribbean Sea and the Gulf of Mexico where it then forms to give force to the Gulf Stream The other section runs by the Leeward Islands then turns north-east then east and goes back to the Azores The speed of this current varies From the Azores to Africa the

North Equatorial Current moves at a speed of five miles a day However from the Canaries to the West Indies it travels twice that rate then it slows up on the return journey from Bermuda to the Azores where its rate is some six miles a day More water appears to go west than the return easterly stream The balance is made up by the *Gulf Stream*

This *Gulf Stream* can be likened to a river in the ocean having a fluid bank and a bottom. It moves faster in the centre and surface because of friction at the sides and base It is warmer and more saline than the adjacent sea and can be distinguished on the American side by its deep blue hue compared with the green inshore waters It arises between Havana and the mainland passes Florida where it is about 44 miles wide and between 400 and 600 feet deep travelling at a rate of 70 miles a day The flow carries on with its axis following the 100 fathom line to Cape Hatteras and then curves towards the sea widening near Halifax Nova Scotia where it is about 250 miles wide about 300 feet deep and travelling at one and a half knots where it divides into five separate streams

One part joins the returning Azores current the greater part continues across the ocean as a warm surface drift which is assisted by the south westerly winds This drift warms the British Isles not the main Gulf Stream itself The remainder of the drift passes into the Arctic seas between Iceland and Greenland. As it is warmer and heavier than the chilled Polar waters it sinks and gives rise to the phenomenon of a warm current sandwiched between two cold ones

The upper cold layer over riding the warm drift sets south between the two large land areas—Greenland and Iceland bearing the outward flow from the Arctic to Labrador and the north eastern states It then goes southwards along the coast inside the Gulf Stream at a rate of 20-30 miles a day Where it encounters warm water fog arises. as the temperature difference is usually 10-15 degrees As noted, the circular North Atlantic current runs clockwise. The same circulation ring occurs south of the Line but travels counterclockwise in the following manner When the current of the North Equatorial stream turns westward from the African coast, some remains behind and sets south east and east into the Gulf of Guinea until it comes under the influence of the south east Trade Wind, where it is, as well reinforced by the north streaming waters from the high pressure area of the South Atlantic The combined drifts mass together and turn to cross to Brazil as the South Equatorial Current Off Cape San Roque the stream splits up and one part goes north to join the Northern Current on its way to the Gulf of Mexico The other half follows the Brazilian coast south west beyond the Plate and is called appropriately the Brazilian Current It then masses and influenced by the west winds turns and streams back across the south Atlantic to south west Africa and then north again—now called the Benguella Current— and so completes the counterclockwise circulation

The Atlantic currents of the southern hemisphere the Benguella Current the South Equatorial Current and the Brazil Current is a whole system of shallow water movements involving mainly the upper 100 fathoms

The principal currents of the Pacific have the same general features of the Atlantic currents

The Japan current Kuroshwo or Black Current is analogous to the Gulf Stream

It is a highly saline very dark blue body of water which arises from sources in the East Indies and helped by the powerful current through the Malacca Strait, travels past the Philippines and Japan to become dispersed in the large body of water north of 45° latitude It then rolls northwards along the continental shelf off eastern Asia and is driven away by the mass of icy water of the Oyashio Current that comes from the Sea of Okhotsk and the Behring Sea

Some offshoot streams warm the otherwise bleak shores of Alaska within a few degrees of the Arctic Circle

The Pacific equivalents of the North and Equatorial currents exist The Labrador Current is paralleled by the cold Kurile Current which forms the fog banks of Sakhalin The Humboldt Current another cold current passes up from the Antarctic reservoir, hugging the South American coasts to cool the arid wastes of Peru and Chile It has a speed of advance of 30 miles a day

Where the Humboldt Current turns west across the Pacific off the coast of Callao, Peru is the place where the story of the Kon-Tiki Expedition began in 1947, of a raft adventure across the south seas in the South Equatorial Current which was so well described by Thor Heyerdahl in his *Journal*

The Indian Ocean currents are very complicated and in the Bay of Bengal they change in force and direction constantly owing to the varying influence of the monsoons

In the seldom traversed sea area of Madagascar there is a simple ring like circulation similar to those of the other oceans

The Southern Ocean, that world wide expanse of blue sea arbitrarily defined by the 40th parallel on the north and by the Antarctic Circle in the south has a steady continuous eastern drift

The boundary lines of the Southern Ocean are very real demarcations as it effectively divides marine and even bird life at the latitudes above and below the lines known as the Antarctic convergence This is seen in the south in the diluted cold water of the West Wind Drift which meets the more saline and warmer water of the sub-Antarctic zone

In more northerly latitudes about 40°S another less well defined water boundary is formed where the sub-Antarctic water meets the warmer sub-tropical zone

Below the surface layer of the West Wind Drift is a layer which is moving south and east the water from the north Atlantic which sank and slowly spreads out southwards

Other large water movements are the renowned marine eddies the Charybdis off Messina the Maelstrom off Norway, the Devil s Cauldron off north-west Ireland and in the channel between Scotland and the Shetlands

As noted in the northerly drift of the Gulf Stream there are different layers of circulation in this case due to temperature difference However it is more general without difference of temperature to account for a second scheme of circulation beneath the ocean surface

One example is that concerning the South Equatorial current at the surface which moves west between Ascension and Cananea at approximately half a knot whilst a second stream 100 200 feet below is setting east at twice that speed

Along the bottom of the Southern Ocean the cold dense water tracks north and east to reach the Northern Hemisphere Thus the circulation in the South Polar area follows a similar pattern of surface and bottom layers moving north while a sandwiched layer between the two flows south from the Equator and sinks at the South Polar area

A transverse ridge the Walvish Ridge which runs north-east from Tristan da Cunha towards Walvish Bay West Africa is called by Pettersson (1954) a submarine barrier that holds back the icy waters of the Antarctic depths and prevents their entry from the south into the eastern Atlantic Deep There is a corresponding barrier running westward from the Mid Atlantic Ridge the Rio Grande Ridge which is broken through by a wide submarine channel allowing the bottom Antarctic Current to enter into the Western Atlantic Deep where the cooling effect is apparent in the deep waters as far north as Bermuda

The North Polar area is complicated by large land masses which obstructs and deflects current flows whilst large deep ridges cut off water flow along the sea floor However boundaries between different masses of water exist In the North Atlantic a cold wall separates the water of the Labrador Current from the Gulf Stream and another boundary separates the Gulf Stream from the North East Trade Drift west of the Sargasso Sea Similarly in the Pacific there is a well defined cold water wall between the warmer Kuroshwo Current and the colder water of the Behring Sea (Ommanney 1955)

The enclosing rims at the outlets of deep inland seas the Mediterranean and Red Sea are subjected to sea water movements These barriers are so near to the surface that evaporation and increasing salinity would soon cause marked changes in the physical state of the confined sea were it not for submerged currents that flow outwards to counter balance the inward stream at the surface An example of this is the counter current off Gibraltar The surface water down to about 450 feet flows into the Mediterranean at a rate of speed up to two knots At the same time, an outward current from the 450 feet to 1 200 feet depth bears away the more saline Mediterranean water at a speed varying from half to four knots This state would apply at still water as both rates vary with the circumstances of the tide

To pause for a brief summary and to consider our notes up to this point it would be as Carson (1956) implied that the oceans are really one They are given geographical names but the waters are not wholly of one specifically named ocean The dark hidden currents of the deep abyss the upwelling the icy creeping drifts have made all waters mobile At the same time the deep and surface currents the tides, the earth's spin and the ice formation the evaporation by the hot sun cloud drifts winds and storms could mean that one particular molecule of sea water lived many lives in many forms and touched many lands

(To be continued)

ON TELLING THE PATIENT

By Surgeon Commander J. F. MEYNELL, Royal Navy, Surgeon Lieutenant-Commander N. G. B. HERSEY, Royal Navy and Surgeon Lieutenant-Commander J. COX, Royal Navy

Two patients recently admitted to the Royal Naval Hospital Plymouth for elective surgery were unnecessarily endangered by not having been informed of the nature of drugs with which they were being treated or to which they were known to be sensitive

Case 1

A poultry farmer aged 53 was admitted on the 28th February 1961 for herniorrhaphy. His only complaints apart from the hernia were slight breathlessness on exertion and "lumps under the skin" for which he had been under treatment for about three years by a civilian dermatologist. On examination he had a very florid complexion was obese and mildly hypertensive. He exhibited no purple striæ and his appearance was not that of a typical Cushing's syndrome.

The Senior Pharmacist was unable to identify positively the tablets which the patient had been taking for over two years and after prolonged telephone enquiries to the skin department he was attending in a National Health Service Hospital the anæsthetist was informed that the patient was suffering from sarcoidosis and was being treated with prednisolone. The operation was therefore covered with cortisone in the usual manner and the patient was discharged from hospital in the normal time having made an uneventful recovery.

Case 2

A Leading Airman aged 24 was admitted on the 13th March, 1961, for haemorrhoidectomy. On admission he was found to be recovering from a cold and operation was postponed until the 20th March. When he was seen by one of us the day before operation he admitted on questioning that his only previous anæsthetic had been in another Naval Hospital in 1957. He stated that there had been trouble with his breathing post operatively and that when he woke up there were four doctors round his bed. Following this he had been sent to the laboratory for a blood test. Apart from this the only other possibly relevant history was that he suffered from multiple allergies. On examination he appeared a fit man.

Perusal of his documents confirmed the history of allergy and revealed the following extracts:

30 9 57	Patient suffered a respiratory depression but returned normally to consciousness
2 10 57	Patient sent to Path. Lab. for examination of blood serum as requested by the anæsthetist

The story suggested among other things a possible sensitivity to suxamethonium chloride although we did not know that he had had this drug during his previous anæsthetic

He was given promethazine 50 mgm the night before operation and his premedication was papaveratum 20 mgm with scopolamine 0 4 mgm. at 11 45 Anæsthesia was induced at 12 25 using thiopentone 0 4 gm A carefully measured dose of 10 mgm of suxamethonium chloride resulted in marked fasciculation followed by total apnœa Endotracheal intubation was performed and anæsthesia maintained using nitrous oxide/oxygen 80/20, a non-return circuit and the Blease Pulmoflator At 12 47 the ulna nerve stimulator revealed returning muscle power from a depolarising type of neuromuscular block Recovery was rapid and uneventful

Since this was not a dual type block a plasma pseudocholine-esterase estimation was carried out and showed a level of 40 micromols/ml /hour (Normal 130-310)

Discussion

Many drugs can give rise to dangerous situations during and after anæsthesia if the anæsthetist does not know that they have been given to his patient Probably the most important group are the corticosteroids but others include digitalis, hypotensive agents diuretics and tranquillizers From bitter experience most anæsthetists ask all patients specifically what drugs if any they have taken previously and far too often as in Case 1 they do not know

All who prescribe corticosteroids are aware that courses of these drugs may lead to circulatory collapse under anæsthesia for up to two years later unless precautions are taken Surely then the patient must be told this in such a manner that it will remain fixed in his mind without causing alarm It would also be of great value if such tablets were stamped with their identity and the bottle labelled

With regard to the second case there can be no excuse when a patient presumably known to be sensitive to suxamethonium is not informed of this fact A normal dose of suxamethonium given by an inexperienced anæsthetist would have given rise to great anxiety and might have proved dangerous for the patient

We would like to make a plea that in all such cases not only should the patient be told but the fact should be recorded in both his paybook and medical documents

Summary

Two cases are described one who did not know that he had been on prolonged steroid therapy, and another who had not been told when he had been found hypersensitive to suxamethonium The danger of these omissions is mentioned and a plea made to tell the patient the name of any drug he is given or to which he is hypersensitive, especially when they may endanger him during subsequent anæsthesia

ACKNOWLEDGMENT

We wish to thank Surgeon Rear Admiral J Mansel Reese *O B E*, Q H P , for permission to publish details of these cases and Surgeon Lieutenant-Commander R Forrester for arranging the pseudocholine-esterase estimation

TROPICAL HYGIENE, 1807

By Surgeon Commander F H LAMB, R N

WHILE looking through the Officers Mess Library in the Royal Marines Barracks Eastney I came across a manuscript of the Daily Orders issued from the Headquarters of the Royal Marines in Fort Amsterdam Curaçao This fort was assaulted and taken on the 1st January 1807 by a force of seamen and marines from H M Frigates *Arethusa*, *Latona*, *Anson* and *Fishguard* the orders extend from the 3rd January to the 27th April of that year

These orders make intriguing reading and for the Medical Officer are somewhat surprising because of the quite advanced measures that were taken to safeguard the health of the unit—including a very early reference to the sterilization of drinking water which would appear to have been far ahead of civil practice of that period During the four months covered by the narrative those orders referring to health and hygiene are repeated over and over again this would indicate something of the importance that was attached to the precautions taken

A somewhat macabre aspect of this chronicle of a very small fragment of British history is the fact that funeral parties were detailed almost daily There is no clue to the nature of the illness that caused this death rate, but the geographical area and the period suggest the possibility of yellow fever In this connection it is interesting to note that the wearing of musquito trousers is repeatedly mentioned and mentioned as Dress of the Day at a time when I think it is very doubtful if any connection between mosquitos and yellow fever had been recognized This may have been mere coincidence it may have been for protection against the discomfort and nuisance of mosquito bites without any knowledge of the diseases transmitted by them or it may have meant that Naval Medical Officers had realized that mosquitos could be the vectors of some of the many dangerous illnesses that plagued the Navy and Army on tropical service

This was an age when punishments were frequently brutal by the standards of today (I have seen records of 500 lashes awarded to an absentee, 300 lashes for irregular behaviour, and 14 days in the Black Hole for a similar offence) and therefore it is pleasant to see that in some units at least the officers took a real and intelligent interest in the welfare of the men and that some very advanced, albeit rule of thumb measures of hygiene were enforced Modernized slightly the regulations quoted below would not seem out of place today in the Standing Orders of units serving abroad

> 9th January 1807 It is my positive orders that no Non-Comd Officer or soldier will Urine or throw Water out of any of the Windows or Doors of their respective Barrack Rooms

16th January 1807 It is my positive orders that no Negro Wenches be permitted into the Rooms of the Barracks and that should any Room be left without a Non Comd Officer the last that quits the Room is to deliver the Room up to the most burly Man in it who is to be answerable to the Punctual Observance of the order

23rd January 1807 It is my positive directions that the Officer of the Day do see the Men s Grog mixed with three waters it is also my direction that the Non-Comd Offices do see that a Quantity of Water be boiled every morning for the use of the Men in their Rooms to drink only and that in future no Water will be drank without it having been previously boiled the Men will scrub their Blankets this evening and no Parade

28th January 1807 All Hammocks and Bedding to be washed once a Week and exposed as well as their Cloathes daily if the weather permits for two hours in the open Air & the Rooms sprinkled with Vinegar and fumigated twice a Week.

2nd February 1807 In future every Non Commissioned Officer and Private Soldier will bathe in the Sea every morning at Break of Day the Officer of the Day attending them and see them stay but a short time in the Waters

7th February 1807 the Rooms washed and swabbed well and dry

15th February, 1807 It is my direction that the Empty Rooms in the Garrison be washed to-morrow and continued from time to time until the whole have been well washed and cleaned

17th February 1807 It is my directions that all the Convalescents do cut stuff for Brooms the Commdg Officer of the Convalescents to see this order put in Execution in the Grey of the morning

26th April 1807 Hammocks Blankets and Bugs to be scrubbed after Gunfire the Bedding to be aired as usual "

ACKNOWLEDGMENT

I am indebted to the Commanding Officer Royal Marines Barracks Eastney Colonel N H D McGill for Permission to publish these extracts from manuscripts

BARRIER CREAMS AND HAND-CLEANSERS IN INDUSTRY

By Surgeon Commander ALAN ROBINSON, R.N. and Surgeon Commander RONALD SCUTT, R.N.

THOSE who earn their living by manual work are as likely as the rest of the population to develop rashes on the hands. It is somewhat natural that they should often suspect the cause as being something with which they have come into contact (especially in their work)—and it is quite probable that their medical advisers will encourage this line of thought. The possibility that the trouble might be due to other causes—e.g. eczema of constitutional, infective or psychosomatic origin—will often not be considered. By the time an expert dermatological opinion is sought, the picture may well have been changed by superadded factors such as lichenification, infection and perhaps medicamentosa reactions. The initial cause will be far from clear, and only very careful history taking may reveal the truth.

In this country the importance attached to the danger of contact irritants in industry was perhaps due to a memorandum in December 1942 of the Ministry of Labour and National Service (Factory Department) on "The Prevention of Industrial Dermatitis with Special Reference to the Use of Barrier Substances". Such protective ointments (Schwartz, Tulipan and Peck) should have the following properties:—

(1) They should be non-irritating and non sensitizing.
(2) They should offer actual protection from the irritant.
(3) They should be of such consistency that they can be applied easily.
(4) They should be easily removed after work and yet stay on while the worker is exposed.

Over the past two decades proprietary firms have produced a number of applications which are reputed by the manufacturers to fulfil the above criteria.

More recently, however, doubt has begun to arise, especially in the minds of dermatologists, as to the efficacy of, or even the necessity for, barrier substances. While no one would deny that there are jobs in industry where the worker is liable to be exposed to primary irritants and sensitizing agents, the industrial medical officer knows that the vast majority of persons who use barrier creams do so because their job is a dirty one involving oil and grease, etc., and they find that soap containing cream is an aid to skin cleansing. But MOST OILS AND GREASES ARE NEITHER PRIMARY IRRITANTS NOR SENSITIZING AGENTS, and therefore PROTECTION is not a "must". Wilson (H. T. H.) (in press) in analysing the causes of 51 cases of exogenous dermatitis seen in a heavy engineering factory, reported cutting oils as being responsible in 18 cases and paraffin in seven, but no other type of oil or grease was found to cause trouble.

If there is danger of dermatitis can protection be provided by the use of any known Barrier Cream? Porter (1959) carried out a series of laboratory tests regarding

(1) Resilience of film

(2) Drying out in use

(3) Protection against soluble oils

He came to the conclusion that "In the main the barrier substances marketed today do not give the degree of protection claimed by the makers" and he stated that in his opinion "The prevention of dermatitis must lie elsewhere than in the use of barrier substances unless drastic changes are made".

Is there any evidence to suggest that the use of barrier creams is potentially dangerous?

(1) Kuske *et al* (1956) did 48 hour patch tests with a soap-containing "barrier cream" (Kerodex B.D.) and attained 70 per cent positive reactions. Tas (1957) with the same material had 49·7 per cent positive reactions. These reactions are no doubt due to the primary irritant effect of the soap in a concentration of over 10 per cent. Soap degreases the skin and causes denaturing of keratin probably by the removal of certain amino acids. This "chapping" effect is commonly complained of by workers who regularly apply soap containing barriers to the skin. The fact that the majority do not get reactions in spite of the positive patch tests is probably because (a) the material gets rapidly removed by friction and sweating, (b) the skin is not occluded by plaster dressing as in the patch test.

(2) There is evidence that degreasing from soap and other detergents causes an increased sensitivity of the skin to other potential irritants.

(3) Any area of minor skin irritation or trauma would be aggravated by the application of a soap containing barrier.

(4) Most barrier substances are designed for protection against *either* water-soluble *or* oil soluble irritants. But some irritants (e.g. tar) are both oil and water soluble and the barrier cream would then *increase* the intimate contact with the epidermis which may be necessary to cause damage.

(5) Many barrier creams are designed to act by blocking the hair follicles. This means (Porter) that cleansing of the skin can often be achieved only by hard scrubbing which can obviously cause damage.

(6) Silicone barrier creams appear to be quite effective against water-soluble irritants such as detergents but it has been shown that after repeated application it is virtually impossible to remove the film by a single washing and this degree of poral blockage is clearly undesirable.

The evidence therefore suggests that not only are barrier creams inefficient as protectors, but that they are potentially dangerous. Why then are they still so widely used? The main reason, until very recently, was that the Courts had made it abundantly clear that it was the responsibility of industrial executives to see that a suitable barrier cream is always available to the worker. However in a recent action in the High Court of Justice (Watson v. Ready Mixed Concrete *The Times* 18.1.61) Mr. Justice Davies dismissed a claim for damages against the employers in which the plaintiff alleged that he had developed dermatitis of the hands due to "cement, grease and filth" because a barrier cream had not been provided. He accepted the opinion of the expert witness (Dr. F. R. Bettley) who stated that "The

practical value of a barrier cream in preventing dermatitis due to cement or oil had not been proved by scientific evidence and was a matter of presumption and there were some both dermatologists and industrial medical officers who considered that barrier creams did more harm than good" Mr Justice Davies then expressed the hope that "If barrier creams so far from being a protection might be a snare and might aggravate instead of protecting workmen's conditions that snare might be speedily removed"

The other reason for the popularity of soap containing barrier creams is their efficiency as skin cleansers Skin cleansing after dirty work can be achieved in various ways

(1) By very powerful degreasants such as petrol paraffin turpentine trichlorethylene etc all of which are strong primary irritants and therefore clearly undesirable

(2) Solid or liquid soap

(3) Modern industrial cleansing liquids or jellies

(4) Soap containing barriers applied before work

It has been pointed out that soap is a primary irritant to the skin and yet for the past two decades we have been blithely encouraging workers to apply an ointment containing about 10 per cent of a primary irritant and to keep this in contact for perhaps eight hours a day If dermatitis develops we blame everything except the "barrier" for by its very name how could it possibly be responsible? Surely it is evidence of the miraculous resistance of the epidermis that we do not see much more trouble resulting from soap containing barrier substances?

The danger from solid or liquid soap (neither of which is a very good cleanser for oil and grease) and industrial cleansing liquids and jellies (which appear to be far more efficient) is minimal because the length of exposure is short and the concentration comparatively low

It was with these thoughts in mind that we started an investigation in H M Dockyard Portsmouth into the efficiency of a proprietary hand-cleanser called Saroul which is a Naval Store item though in limited stock Saroul had been found to be most efficient in the Dockyard Surgery for cleaning the skin of patients before treatment of cuts Its efficiency was dramatically shown when we were faced by a patient who had upset a pot of Bitumastic over his head and were able to make him not only recognisable but socially spotless

With the approval of the Medical Director General it was decided to make an industrial trial of Saroul in various shops in the yard Saroni Hand Cleanser is marketed by Messrs Sandeman Brothers Ltd of Glasgow, in the form of a liquid and a jelly Because of the very limited quantities available in Naval Stores the makers were approached and asked to provide supplies This they did most willingly and most generously not only supplying the quantities we needed but also letting us have their confidential formula

The plan of trial was (a) to substitute Saroni liquid for liquid soap in the dispensers above washbasins in the Engineering Department Factory and the foundries (b) to install dispensers of Saroul jelly in certain other shops including M E D Bottle Shop and Tool Room and the Motor Transport Depots at Stamshaw and in the yard The jelly needs special dispensers which Messrs Sandeman provided as well

It was also decided to try to discover how many of the men involved in the trial used barrier cream as a routine and the questionnaire devised to record the trial was modified accordingly The pro-forma used was under these headings —

PREFERENCE

Name	No	Liquid Soap	Saroul Liquid	Saroul Jelly	Do you use Barrier Cream?

With the assistance of the foremen of the various shops involved arrangements were made to substitute Saroul liquid for the liquid soap normally supplied A small notice was put above each washbasin or washing-fountain explaining the trial and how the hand-cleanser was to be used

After two months when the ample supplies of Saroul had been nearly expended one of us made personal visits to all the Shops and interviewed every man who worked in the selected areas Identical questions were asked of each man and no attempt was made to influence his replies one way or another The results are tabulated in Table I

TABLE I

	Men preferring		Men who use Barrier Cream			Men who would use exclusively	
	Liquid Soap	Saroul Liquid	Always	Occasionally	Never	Barrier Cream	Saroul
Engineering Factory							
No 2 Bay	2	5	0	4	3	1	4
No 3 Bay	12	15	10	12	5	10	5
No 4 Bay South	11	12	7	7	7	2	10
No 4 Bay North	19	34	11	20	12	7	17
No 5 Bay	11	7	7	6	5	0	7
Non Ferrous Foundry	6	24	13	10	7	10	14
Pattern Shop	8	17	4	6	10	2	10
Steel Foundry	8	14	4	10	8	4	10
	77	113	56	77	57	36	77
		Imprvd Saroul					
Tool Room	9	15					
		Saroul Jelly					
Tool Room	14	15	3	20	6	4	11
Yard Garage	2	15	2	9	6	2	13
Shimshaw Garage	6	34	19	16	5	12	35
	77	64	74	45	17	18	46

Ideally every man would have expressed himself as entirely satisfied with Saroul as a hand cleanser and would have preferred it to the barrier cream which has been available for some years to anyone who wants it ' Ideally because as is pointed out above modern dermatological opinion is confirmed in the view that barrier creams are of very limited use in protecting the skin of industrial workers and may even themselves produce a dermatitis—the very thing they were designed to prevent. The ideal hand-cleanser however almost certainly does not exist. and we find that different types of work lead men to settle on different brands of hand-cleanser Similarly different types of hand-cleansers appear to suit different kinds of skin though this is only an impression gained from our experience and the remarks of some of the men questioned In general Saroul was judged to be an efficient hand cleanser in some shops a first-rate commodity in others and superior to liquid soap in most Thus 113 men (66 per cent) out of 190 in all preferred Saroul liquid to liquid soap, and 68 per cent out of 113—not entirely the same individuals—said they would prefer Saroul liquid if they had to use either Saroul or barrier cream exclusively But the vote for Saroul liquid was as high as four to one in the non ferrous foundry, was only just in favour in three bays in the factory and was against Saroul liquid in one bay The two Motor Transport Depots voted 49 to 8 (86 per cent to 14 per cent) in favour of Saroul Jelly but the Tool Room men were divided almost equally in their opinions

Objections to Saroul liquid and jelly (which usually went with negative votes) were to its smell most noticed when the men were eating and the disadvantage of having to start with dry hands In explanation of the latter point—the instructions insisted that Saroul liquid (and jelly) should be rubbed well into the hands before water was applied The objectors made the reasonable point that this meant drying the hands (and dirtying the towel) if the first application was not completely successful The manufacturers have since made it clear that the second application need not be to the dry hands Another objection was to the scum left round the basin when Saroul in either form was used

Advantages were said to be that Saroul made the skin softer prevented chapping and was kind to cuts and abrasions However there was no cold weather during the trial and the claims for beneficient side effects were fewer than the complaints of disadvantages

The manufacturers have now produced an improved Saroul liquid which they claim overcomes the difficulty of scum on washbasins and they claim also to have overcome the smell disadvantage by using containers lined with epoxy resin or tinplate since they state that the odour is due to a reaction with metal during storage We received a small supply of this improved Saroul only enough to try it for a short time in one place—the Tool Room It cannot be regarded as significant that it sent up the pro-Saroul proportion of opinion from 15/14 to 15/9 but at least the trend was more favourable The absentees were regarded as being 5/3 for and against Saroul

The findings on barrier cream were interesting Each man was asked whether he used barrier cream always occasionally or never and as a second question those who preferred Saroul to liquid soap *and* used barrier cream were asked to state their exclusive preference It emerged that 56 men (30 per cent) always used barrier cream

before [illegible] work 77 (40 per cent) occasionally used it and 57 (30 per cent) never used barrier cream at all The occasional users were men who applied barrier cream before starting an unusually dirty job such as handling cast iron that is to say their aim was to keep the hands as clean as possible Of the constant users many did so because the cream supplemented the cleansing action of liquid soap There were very few, not more than half a dozen who mentioned dermatitis and our feeling is that dermatitis is assuming its proper position as an infrequently occurring result of yard work

Of the men who answered the second question 77 (68 per cent) would exclusively use Saroul in preference to a barrier cream and 36 (32 per cent) would use the latter rather than Saroul

These conclusions can only be tentative and no evidence of statistical value emerged or is claimed There is no doubt in our minds however that the time has come to replace barrier cream with a hand-cleanser

The incidence of skin disease in dockyard workers is not particularly high and an accurate analysis of cases has not yet been carried out It is intended that the next stage in our investigation should include the examination by a dermatologist of all persons complaining of skin symptoms however trivial It may then be possible to determine whether minor reactions from soap-containing barriers are commoner than might be imagined

Summary

The case against barrier creams for general use in industry is presented and a trial of a proprietary hand cleanser suitable for use as a substitute is described

Acknowledgment

We are indebted to the Admiral Superintendent and the Departmental Managers of the yard for approving and co operating in the trial to Mr Patrick Sandeman B Sc the Managing Director of Sandeman Brothers Ltd for his generous help and to the Medical Director General of the Navy for permission to publish the results

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TRIFLUOPERAZINE (STELAZINE) IN THE TREATMENT OF SEASICKNESS

Lieutenant-Colonel W. N. S. DONALDSON, R.A.M.C.

This country's international commitments have made all branches of the service so mobile that in the last two decades service men and their families are being more frequently moved all over the world by air and by sea. In addition conditions of modern warfare necessitate the transport of large numbers of men by sea and by air who may be expected to go into immediate action on arrival at their destination. Their own lives and the ultimate outcome of the engagement may well depend on their fitness to give battle. Experience of combined operations has shown that motion sickness can incapacitate large numbers of men and in this respect there are many more casualties from seasickness than from airsickness. The majority of sufferers from seasickness recover rapidly in one or two hours after landing or when the excessive motion of the ship subsides, but they may not be fully fit to fight for several hours after cessation of nausea and vomiting. A small proportion of men may be prostrate and are often completely helpless, and it will be appreciated that under certain circumstances, such as shipwreck, seasick personnel may well die from exhaustion and exposure who would otherwise recover if adequate thereapy was available.

There are several factors involved in the aetiology of seasickness but the primary factor is generally accepted as a stimulation of the vestibular apparatus through linear movement (Chin & Smith, 1955) and by vertical acceleration and deceleration. In addition there are probably also visual and olfactory factors involved, as many people may not be sick until they see others vomit or come into contact with malodrous fumes from the engine room or galley. It is certain that psychological factors are important and it is of interest to note in this connection that children seem to be less prone to seasickness than adults, although children and dogs succumb more easily to car sickness.

A large number of remedies has been used for the treatment of motion sickness including hyoscine hydrobromide and some phenothiazines. Hyoscine hydrobromide is potent and effective but its atropine-like side effects are uncomfortable and the drug tends to lose some of its effectiveness after 48 hours (JAMA 1956 March). The phenothiazines and antihistamines vary in effectiveness and a proportion of patients become drowsy, which is a great disadvantage when troops are preparing for action or are working aboard ship.

Trifluoperazine has been shown to be an effective antiemetic (Ballinger 1959) and is of special value in pregnancy (Sklar 1959) and in motion sickness (Turnbull 1959 and Joiner 1961) without side effects and rarely produce any drowsiness.

Recently it was possible to investigate the effect of trifluoperazine in large numbers of sea sick personnel under varying weather conditions. Trifluoperazine (stelazine) in spansule capsule form was used in these trials in order to obtain a slow release and a sustained therapeutic effect. A valuable asset where repeated ingestion is undesirable. This could also be of considerable value in the prophylactic treatment of seasickness.

Methods and Material. Four hundred and five patients were treated with trifluoperazine spansule capsules, each spansule capsule containing 2 mgm. of the drug. All the cases were treated aboard the *Nevasa* trooping to Hong Kong and back via Ceylon and Singapore. *Nevasa* is a modern vessel of 20 527 tons and 609 ft. waterline built as a troopship. She is a good seaboat able to maintain her speed of 17 knots in bad weather. She is fitted with stabilizers which reduces the roll, the pitch however remains and the rise and fall was estimated at between 20 and 25 feet during the worst weather. The periods of bad weather occurred outward bound and homeward bound in the Bay of Biscay and similarly in the Indian Ocean and China Sea. Inclement weather conditions varied on each occasion and on the average lasted five to seven days. All patients were over the age of 16 years and the range lay between 18 and 40 years. 328 were males, 77 females. Twenty patients who were prostrate and collapsed had to be carried to the ship's hospital and there treated. The remaining patients were seen either in the medical inspection room or in their cabins.

All patients were kept in bed and given one stelazine spansule capsule (2 mgm.). Three or four hours later they were sent on the upper deck and advised to take a light meal. Six hours after the initial medication a second spansule capsule was given and repeated again after a further twelve hours, and then as required. The same treatment was given to the 20 hospital patients except that they were kept in bed for a longer period of time before being sent on to the upper deck. In a few cases the medication was continued for two or three additional days with one spansule capsule each morning before breakfast. These were female patients who were of a nervous disposition and apprehensive that they would relapse if they failed to continue treatment.

Eight patients only complained of possible side effects which could be attributed to the drug. They complained of headache, dry mouth and giddiness after taking a total of 12 mgms. of stelazine in three days. These symptoms cleared up on withdrawal of the drug and as the ship steamed into calmer waters. No other side effects were seen.

Assessment. Results were graded as follows —

Good	No symptoms three to four hours after taking the first spansule capsule
Fair	Where nausea, headache or dizziness persisted to some degree after vomiting ceased, but not of such severity as to interrupt normal routine
Poor	Where there was little response or residual symptoms were sufficient to interrupt normal routine

An analysis of the results is shown in the following table.

Date		Weather Conditions *Beaufort Scale	Good	Fair	Poor
Nov 1960	Bay of Biscay	4–6	59	24	1
Jan 1961	Bay of Biscay	8–10	138	38	5
Nov–Dec 1960	Mediterranean and China Sea	3 5	83	53	4
			280	115	10

*Beaufort Scale 3–5 Gentle to fresh breeze Wind Speed 24 m p h
4–6 Moderate to strong breeze Wind speed 31 m p h
8–10 Gale Wind speed 39 72 m p h

Discussion

The patients in the three groups in this series were treated therapeutically An additional ten passengers were given the drug prophylactically in the same dosage as they reported that they were habitually bad sailors All these ten passengers were completely free of symptoms One of these had for the first time after many voyages enjoyed his passage

Those patients who were brought to the hospital in a collapsed state recovered and were back on duty within 24 hours All these patients were young soldiers on their first sea trip They all occurred outward bound in the Bay of Biscay with weather of moderate severity only (Beaufort scale 4–6) It is very unusual to see cases of seasickness with prostration at the end of a voyage It is reported (Turnbull, 1959) that this type of case responds rapidly to intramuscular injections of stelazine It is of interest to mention that nine pregnant patients (although not all seasick) were given stelazine spansule capsules for nausea and vomiting of pregnancy with excellent results Eight were multiparæ and all these had had vomiting with previous pregnancies

Joiner (1961) has shown that a single dose of stelazine 5 mgm in tablet form repeated once or twice daily is effective in the control of seasickness and is to be preferred to 1 mg twice or three times a day (Turnbull 1959) The results of this trial show that the drug in smaller dosage in spansule capsule form is equally effective This lower but sustained dosage is of considerable value in seasickness where bad weather may be experienced for several days on end So often patients will recover from their initial attack in 36-48 hours only to relapse with a change of ship's movement It is for these not infrequent conditions that the spansule capsule is to be preferred to the 5 mg tablet of stelazine as the patient can maintain a satisfactory therapeutic response for several days with a relatively low dosage of the drug without side effects

From my results there is some evidence available to show that trifluoperazine is valuable in the prophylactic treatment of seasickness. The results obtained in these series suggest that a controlled trial at a later date would provide interesting and valuable information.

Summary

(1) Four hundred and five patients with seasickness were treated in a troopship at sea under varying weather conditions.

(2) Two hundred and eighty showed a good response, and were relieved of all symptoms, 115 responded but had some residual nausea or headache, ten failed to respond to stelazine.

(3) Trifluoperazine (stelazine) in spansule capsule form has been shown to be a valuable drug for the treatment of seasickness.

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Clinical Notes and Cases

A CASE OF DENTAL CYST IN A PATIENT SUFFERING FROM FAMILIAL ANGIO-NEUROTIC OEDEMA

By Surgeon Captain (D) A. MACDONALD-WATSON and Surgeon Lieutenant J. F. DAVIDSON, R.N.

Family History

Father died æt. 45. Rheumatic Heart Disease. Mother æt. 50, alive and well—has suffered from angio-neurotic œdema association with bilious attacks all her life. Three sisters alive and well—no angio-neurotic œdema. Second cousin (female) on mother's side died from œdema glottidis of angio-neurotic type.

Previous Medical History

Repair left inguinal hernia æt. 11. Removal U.D.T. æt. 18. Appendicectomy æt. 20.

History

Between the ages of five to nine years he attended Leeds Infirmary for the investigation of these attacks of recurring œdema. Then, after an investigation for allergy he underwent what sounds like a course of desensitization.

No specific allergen was isolated. He was subsequently symptom free for about five years, till the attacks returned on his entering employment, and in most cases were related to trauma. When he accidentally struck his hand with a hammer a patch of œdema would appear at the site of the blow, and spread over the dorsum of the hand and up the forearm. A blow to the foot would similarly produce œdema. After several such episodes the part seemed to become conditioned to the trauma and œdema would then fail to appear. Œdema also appeared on the perineum after his first cycling trips.

In 1955 he developed œdema of the lower lip, and again in 1958 of the lips and face and orbits. No history of trauma is available. In 1959 following a fall œdema developed on the scrotum and penis and also the right forearm, again that year after sitting on a sharp edge for two to three hours; both hands, scrotum and penis were affected.

In March 1960, on board H.M.S. *Albion*, he presented with once more marked œdema of penis, scrotum and perineum and a patch of urticaria on the left forearm. This was triggered off by sitting on a sharp edge whilst working in a confined space. The œdema began first in the lower buttocks, spread along the perineum, and into the penis and scrotum (Fig. 1).

On examination the œdema was found to be tense, non-pitting and non tender. There were no urinary difficulties.

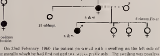
He was admitted to sick bay and treated with bed rest and scrotal support. 0·5 ml. 1/1,000 adrenaline was administered subcutaneously, and at the same time 8 mg.

Fig. 1

Fig. 2

Piriton [illegible] was given. [illegible] had no effect on the oedema but the urticaria cleared in one hour. The Piriton dose 8 mg was repeated twice over the next 24 hours.

The oedema after 48 hours began to subside slowly, disappearing first from the perineum and finally from the prepuce after 72 hours (Fig. 2). The 72-hour cycle [illegible] seems to have been a feature of all previous attacks.



On 23rd February 1960 the patient presented with a swelling on the left side of the maxilla which he had first noticed two weeks previously. The swelling was painless and fluctuant, about 4 cms. in diameter extending from 3 to 7 palatally to the mid-line and buccally to push out the cheek and be evident extra orally. /6 and 4 were carious dead teeth.

He was admitted to the Royal Naval Hospital Malta on 16th March 1960 where X ray examination revealed a dental cyst in /456 area Distaquaine Penicillin 600 000 units was given and the patient prepared for operation on 17th March The usual premedication of Omnopon 1/3 gr and Scopolamine 1/100 gr was given and the patient intubated under Pentothal N O O2 Trilene and Scoline

At operation a gum flap was reflected from /2 to /7 /456 were extracted and the lining of the cyst dissected out The cavity was packed with half-inch ribbon tape and Whitehead's Varnish

On recovery he was given Piriton 8 mgms to control any possible angio-neurotic œdema and a further 600 000 units of Distaquaine Penicillin was given

On 18th March part of the pack was removed and an immediate denture fitted with a gutta percha bung in the cavity

The patient was kept on 600 000 units Dist Penicillin B D for a further five days and on 24th March a final obdurator was fitted after removing the remainder of the pack

No angio neurotic œdema was observed after the operation and recovery was uneventful He was discharged to his ship on 25th March

Summary

A case of Familial Angio Neurotic Œdema in a male æt 24 His mother and second cousin on his mother's side exhibit the disease In his case face genitals hands and feet have been the only areas involved and unfamiliar trauma seems to be the precipitating factor The condition runs a three day course and is unaffected by treatment

Comment

This patient was afflicted with two apparently unrelated pathological disorders the one (dental cyst) real localized and slow in growth the other potential and systemic capable of causing rapid and spreading swelling of the soft tissues following trauma to the affected part

The treatment plan for oral surgery was directed to preventing or minimising the effects of the necessary surgical insult The operation procedure was carried out under general anæsthetic administered after careful transnasal intubation recognizing that œdema glottidis might be a complicatory factor

The use of the drug Piriton (Chloramphenramine Maleate by Allen and Hanbury Limited) was justified by the absence of post operative and post anæsthetic complications Piriton ' combines high efficiency, low dosage and freedom from side effects such as drowsiness and vertigo which may accompany the use of other anti-histamine drugs When given by injection it is compatible with other parenteral solutions Penicillin blood transfusions liver extracts toxoids and vaccines may be administered simultaneously Four mgm tablets will give relief of symptoms for four to six hours whilst Doulat presentation will act for eight to twelve hours

Acknowledgment

I am indebted to Surgeon Rear Admiral W V Beach O B E Q H S for permission to publish this report

THE ROYAL NAVAL MEDICAL CLUB DINNER, 1961

THE annual dinner of the Royal Navy Medical Club was held in the Painted Hall at the Royal Naval College Greenwich on Monday 1st May 1961

The following guests and members were present

President Surgeon Vice Admiral W R S Panckridge *C B Q H P*

G F Abercrombie *V R D*
G Forbes Abercrombie
M H Adams
D C Aldridge *T D*
A G Allen
Professor P R Allison
J C Anderson *O B E T D*
Ven Archdeacon J Armstrong *O B E Q H C*
A Godwin Austin
A W Badenoch
J Matthew Banks
P C Barkla *V R D*
N R Barrett
F W Baskerville
A D Bateman *O B E V R D*
K J B Battle *M B E*
J Bearcroft
A C H Bell
M Bennett
Henry Bergh
G A Binns
N V Birrell
P Bishop
E B Bradbury
E G Brewis *V R D*
R A L Brewis
F A Broadhead
W D W Brooks *C B E*
A Kingsley Brown *M B E*
W A Bunnell
Professor W Burns *D S C*
H Jackson Burrows
The Earl Cairns *C B*
A E Campbell *C B*
F D Caldwell
C S Cane *V R D*
R L Canney
F C W Capps
J Carson
O N A Cecil
W J F Chambers
C A Cheatle
J A Chavers
G Churchill Davidson
W Cleverly
J H Cobb
Rt Hon The Lord Cohen of Birkenhead
W J Colborne *C B*
S N Cole
R R A Coles
A F Collett *D S C*
I H Colley
P C Collinson *V R D*
C Foster Cooper *V R D*
H S Corfield, *D S C*
D L P De Courcy
Rev J A Coughlan
H H Crabb
G A Craig *M B E*
H E R Cargel *Q H P*
H M Darlow
A F Davidson
G M Davidson
W M Davidson *O B E*
D M Davies
Professor Hallowell Davis
W P Davis
M Davys
R F Doherty
H D Doyle
C E Drew *M V O V R D*
J A Drew *C B*
D Drewery *M C*
T Driscoll
R W Duncan
C T F Ealand
J F Edmonds
T S Fenerl *D S C V R D*
G Ellis
R W Emanuel
F T Evans
Rt Hon The Lord Evans *G C V O*
William Evans
L J Evered
W G Everett
R A Ewing *C B D S C*
Rt Rev Mgr C D Fay *C B E*
C J Ferrigan *C B*
A C Fletcher
G L Foss *O B E V R D*
Ian Fraser *D S O O B E D L*
W F Fraser
J D J Freeman
D G Freshwater
P R Frerich
T W Froggatt *O B E*
Sir William Kelsey Fry *C B E M C*
A C Fuller *V R D*
R H C Fuller *F R G S*
V O B Gartside *V R D*
John Gemmell
A George
B George
R C R Gethen
L Gimson
F C Glover *V R D*
E Godwin
Victor Goldman
D L Goodridge
D Graham Word
Arthur Gray
W J Forbes Guild
J W P Grimmer
D P Gurd
A Hackett Jones *D F C*
A W Hagger *V R D*
D O Hamas
G L Hall Enderby
Alexander Hall *O B E*
F L Hall
A Hambling
W H C M Hamilton
R G Harcourt
J W Harding
T T Hardy
H J Harris
J C Hawksley *C B E*
C P Hay
David Hay
D W Henderson *C B F R S*
A N Hepburn
A Heggerty *D S C*
S L Higgs
J M Hill
G de B Hinde
C A Hodges
J M Holford *O B E*
W Holgate *O B E Q H D S*
F C Hollands
M H W Holloway
F C Horwood
K G Hounsome
D R Hughes *V R D*
Hugo Hughes
W Hughes
J Hunter
M T Inman
L C Dundas Irvine *V R D*
F B Jackson
P M C James
Sir Clifford Jarrett *K B E C B*
D S Jarvis
M O Jenks
J Johnston
W S Johnston *V R D*
F Avery Jones
John Kay
H D Brown Kelly
Francis Kelly
Reginald Kelly
Hugh Kinder

A S Kinnerk
I King Lew
Kirker
A P Kitchin
J J Knight
H E Knott *C B O B E*
Sir John Lang *G C B*
F R Langmaid *O B E T D*
O H Law *L L B*
H M Lamson
E O Lawson
Sir Patrick Lee Potter *K B E Q H S*
B S Lewis *D S C*
D C Lillie *V R D*
R Lloyd Jones
G Lloyd Roberts
G E Logsdon, *T D*
T Keith Lyle *C B E*
Michael Lyon
A M Macarthur
J N W McCage
C L T McClintock
T W McCullough *O B E*
I C Macdonald
R F C Macdonald
R S McDonald
Donald McLaren
I W MacGregor
W P E McIntyre *C B Q H P*
F A F Mackenzie
R A McKeown *O B E V R D*
William McKinnel
T Madill *C B O B E*
E Boyd Martin *O B E*
R M Mason
R Mathews
D N Matthews *O B E*
Sir Cyril May *K B E C B M C*
R T May
J A Mead
M K Mead
J F Meynell
T F Miles
G A Miller
G A H Miller
Stephen Miller
R A Mogg *V R D*
A L W Moore *M B E*
R G W Moore
C Naunton Morgan
A Clifford Morson *O B E*
E V B Morton
Ian M Murray
M Murray
R S Murray
W H Murray
R W Mussen *C B C B E*
C B Nicholson *C B E*
J H Nicolson *Q H P*
C P C Noble *D S C V R D*
K J R O'Connor
D J O'Donoghue
Peter Oliver
P J O'Meara

H Pack *J P*
E H Partridge
H O Paton
C J P Pearson
G M Pearson
A D Petro *V R D*
B W Pitt *V R D*
P Paton Philip
George Phillips *C B Q H S*
Rex Phillips
H R Philpot
R D Plowman
E B Pollard
F T Pollinger *C B E V R D*
B F S Popham
Sir Arthur Porritt *K C M G K C V O C B E F R C S*
Alan Preston
P J Preston
A W Y Price *C B E*
S H R Price
T M L Price
J G Pritchard
Rev H J N Purves
L P Le Quesne
H Quinlan *C B Q H D S*
S G Rainford *C B*
A H Ratcliffe
J S P Rawlins *O B E*
J Mansel Reese *O B E Q H P*
F A Richards
A S Riddell
J Ritchie
C F Roberts
Douglas Robertson
Ivor Robertson
Alan Robinson
A E Roche
G K T Roche
F W Rogues *C B E*
J K Ross
Sir James Paterson Ross *Bt K C V O*
M G Ross
Michael Rowan
A J E Rowe *J P*
G B Rowe *D S C*
N L Rowe
E T S Rudd *C B C B E*
Alan Ruffman *V R D*
N Lloyd Rusby
Brian Russell
J F Ryan
J K Salmon
L F W Salmon *M B E*
L H Savin
Professor R W Scarff *C B E F R S E*
I Schulze
R Scoggins *C B E Q H D S*
C F Seuer
John Shaw
Peter Shaw
M F Sheehan
Professor R A Shooter
J J Slowe
W P Small *V R D*
A J Dryden Smith

F E Smith *M B E*
J Forrest Smith
Professor D W Smithers
T B Snell *V R D*
J N Somers *A F C*
Ralph Southward
H B Stallard *M B E*
W E Starkey
R A Stenhouse
F J Stephens
D P Stevenson
S V Strong
J Symmons *V R D*
R Symmons *V R D*
J A Talbot
Professor G W Taylor
Lionel Taylor
Selwyn Taylor
W B Taylor
A C Thackray
R E M Thompson
F G H Trenbath
J Troup *J P*
E G Tuckwell
T A Turnbull
J W Aldren Turner
P S Turner
P de B Turtle *V R D., Q H S*
C H C Upjohn
C W J Ussher
O J Vaughan Jackson *V R D*
G G Vickery *O B E*
C B H Wake Walker
D F Walsh *C B O B E*
D K T Wallace, *M B E V R D*
L J Wallace
F C Ward
G L Ward *D S C V R D*
R H T Ward
W R Ward
R P Warren
R C Webster
A J Whitaker
Douglas White
Professor A W Wilkinson
K W Wilkinson
A Emlyn Williams, *V R D*
E J Williams
J G P Williams
F A Williamson Noble
Hugh Willoughby *V R D*
K L Wilson
R R Wilson *V R D*
W Wilson
James Wishart
Alexander Woods *T D*
R Woodside
E J S Woolley *O B E V R D*
Professor R F Woolmer *V R D*
C G Wright
A I Wrigley
K C Wybar
W D Wylie
J G Young *D S C V R D*
R H Young
A H Zair

The Medical Director General delivered the following speech

"Vice Admiral Ewing My Lords Gentlemen

As you see from your menu cards there are only two speeches tonight This is because many members have intimated that they want more time after dinner for the serious business of talking and drinking with their old friends However, this really results in my making two speeches instead of one I want to tell you something of the fortunes of the Medical Branch during the year and I want to say something about our guests—so I don't know that you are really going to be much better off

'It is with some misgiving that I make my first appearance before you as M D G because I have not yet forgotten the uncharitable thoughts which have crossed my own mind when I was on the receiving end of this speech in years past It has been said—I suppose originally by our dental colleagues—that a husband is what is left of a lover after the nerve has been killed I suspect the views of the M D G held by most medical officers to be analogous Any virtues he may have possessed are thought to have been wrung out of him on his exhausting climb to the summit'

'I will now tell you a few of the things of interest which have occurred during the year

"As you all must have noticed, a pretty gusty wind of change has been blowing through the medical services of the Armed Forces since the war As far as we are concerned our balance sheet shows on the debit side the loss of eight hospitals and on the credit side a gain of only one—in Mauritius However with the reconstruction of the Sick Quarters at Deal we shall have an excellent little hospital there and we are also considerably expanding our activities in Malta There we are going to provide the medical cover for all the Armed Services including families The choice of hospital is Imtarfa which strategically has every advantage over Bighi though I think we are entitled to shed a sentimental tear over Bighi with its long and happy naval associations

"The extensive family commitment is a new one for us The traditional gibe that the Naval medical officer's familiarity with women and children is social rather than professional contains I fear a small grain of truth Consequently we are calling on the Army for help in these specialities over the next few years This help has been generously and ungrudgingly offered and I record here my thanks to Sir Alexander Drummond, the late D G M S Cooperation of this sort between the three services seems to me a fine thing and we should all welcome and encourage it In doing so we need have no fear of losing our individuality The services will always retain their separate personalities, and though the things which at times divide us are not unimportant they are trivial compared to the things that unite us However, I hope that we shall not be compelled to rely permanently on this particular piece of help In 1963 the Obstetric and Gynaecological Block in R N Hospital Plymouth should be under way so we should eventually acquire enough experience to stand on our own feet and flourish our own forceps

"During the past year I have done a good deal of globe-trotting and have met many perhaps the majority of officers in the Branch and their wives It has been made clear to me that anxiety and apprehension about the future of our Branch is widespread I cannot say that such a feeling is unreasonable but it seems to me a

rather melancholy and bitter irony that it should arise at a moment when our standards of professional practice are at their highest—the result of some 15 years of consistent policy directed to improving specialist training and experience. Everywhere I went Commanding Officers, whether in ships, air stations or shore establishments, spoke with great appreciation of the work done by medical and dental officers of all classes. Nevertheless this anxiety has got to be faced. Since the end of National Service recruitment has practically ceased in the Medical Branch—I feel myself that the defence of this country is an object any professional man must regard as worthy and one to which we can honourably devote a working life. But it is useless to look for self sacrifice. We cannot expect recruitment unless we can offer a career comparable in its balance of advantage and disadvantage with that open to a man of reasonable attainments elsewhere. What I have just said may sound platitudinous. If so I make no apology. A platitude has been defined as a statement of self-evident fact on which no one takes any action. On these platitudes I want all the action I can get.

"Here I feel I should mention the generally satisfactory state of recruitment for the Dental Branch. Possibly alone of all the dental services in this country the Royal Navy has a full complement of dental officers. When it is realized that their financial rewards and conditions of service are no better than their competitors this is indeed a curious anomaly.

Of course they may have a secret weapon but it is more likely due to the inherent pride the individual Dental Officers take in their work, the general attitude of common sense in the Branch and the ambition of their senior officers to maintain the Royal Naval Dental Service as a *corps d'elite* of dentistry.

'As you can well imagine the setting up of a realistic career structure does not rest solely with M.D.G. If it did you all would have much rosier prospects. So would I. It is in fact a long hard struggle with other departments and Ministries. I might describe it as comparable to steering a course between Scylla and Charybdis but we have our lighter moments and one was when I first received news of the exploits of Surgeon Captain Baskerville and his band of jolly sea rovers during the last survival trials. I think he received as much press and television cover as any naval event of the year. I am glad to have the opportunity of saying publicly to him jolly good show.

"Still we have achieved something recently a number of S.M.O.s billets are being scheduled for either three or four stripes. This will enable me to increase the establishment of Surgeon Captains and in due course I hope improve the prospects of both specialist and non-specialist Commanders in the medical and dental services. The itinerant specialist system is working well it is still in its early stages and will be expanded. It has many advantages and is the saving of countless service man hours but much remains to be done, to enrich professional opportunity in the service.

'On one thing I am absolutely determined. There shall be no lowering of the standards of entry. It is a matter of history that recourse to this expedient has sometimes been made in the past. The results have always been deplorable. It must not happen again. Whether the Navy knows it or not medicine and the biological sciences generally have an essential contribution to make to the service. We cannot do that by recruiting those too dull to become consultants or too unstable to run a general practice.

If we have a decent career to offer we must give some thought to how we [illegible] make it known to prospective candidates In the past some very senior officers have visited the Medical Schools and lectured there I suspect that the impact of these august personalities on the young has sometimes been more in the nature of an inverted warning than a spur to emulation I propose therefore to send instead some who are young enough to remember the problems which seem important to the newly qualified and who can talk their language But I did not want to send them until they had a worthwhile line of goods to sell

I am pleased to report that Treasury approval has just been given for equal pay for doctors and dentists there will also be small increases in pay both in the senior and junior brackets There will be an increase in pay for specialists and senior specialists

Medical officers who opt for a three year short service commission will receive on the termination of their appointment £1 500 tax free and those who extend it to five years will receive £3 000 tax free

It is hoped that these fiscal carrots will encourage recruitment but at the same time I consider that it is essential that those officers who opt for a five year short service commission be given every opportunity to work and sit for a diploma and also be encouraged in every way possible to prepare themselves for the rigors and frustrations of General Practice

I now come to my second speech—the welcome to our guests

It is a great pleasure to all of us to have Admiral Commanding Reserves as our guest of honour tonight for is the head man of the Reserves and they representing so large a proportion of our members, it seems only right and proper that he should take the place of the Second Sea Lord who unfortunately, through illness is unable to be present here tonight I suppose this is known technically as a 'stand in' but this is not to say that he is not a star in his own right

Admiral Ewing joined the Navy in 1923 and has spent much of his Naval career in service in destroyers He has also commanded the *Vanguard* he has been Director of the Naval Staff College Greenwich and Naval Secretary to the First Lord In 1958 he was Flag Officer Flotillas (Mediterranean)

Sir we are delighted to have you here with us tonight and offer you a very hearty welcome to the Club

Our other distinguished guests include the President of the Royal College of Surgeons Sir Arthur Porritt the President of the Royal College of Obstetricians and Gynaecologists Mr A C H Bell And here I must apologize to him for the omission of his high office on the menu card The Director General Medical Services of the Royal Air Force Air Marshal Sir Patrick Lee Potter and many other distinguished representatives of the forces and medical and dental professions, the Civil Service and the Churches I hope that they will forgive me if I do not mention them all by name I leave it to you the members of the Club, to make them realize the pleasure we take in their company and our appreciation of the honour they do us

May I just say a word of thanks on your behalf to the Admiral President Captain and Commander of this College We never cease to be grateful to them for their generous help to the Club and are very glad to see them here tonight

Finally, there is one whose presence on any naval occasion can never be allowed to pass without remark It is hard indeed to realize that we shall no longer receive those valued communications—some grave some gay—ending, 'By Command of Their Lordships J G Lang Sir John Lang has been Secretary of the Admiralty for some 14 years and is universally recognized as one of the greatest public servants of our time Some years ago he told me that my service education would not be complete until I had served in Admiralty I'm afraid I've left it a bit late but I wish to take this opportunity to thank him for the care that he and the Civil Officers of the Admiralty have taken over my education since I got here They have been real friends and counsellors to me and my department We all wish Sir John a long and happy retirement At the same time we welcome his successor Sir Clifford Jarrett. Sir John must be a hard man to follow but all those who know Sir Clifford are confident that this great office will lose none of its lustre

' To the private guests may I simply say I hope you are enjoying our entertainment If you are not being properly looked after you have only to report your hosts to me and merciless retribution will descend on them

' My Lord Gentlemen may I ask you now to rise and drink the health of our guests

Replying for "The Guests Vice Admiral R A Ewing C B D S C said

It is naturally a great pleasure for me to be here tonight though this is tempered by having to make a speech when I thought that for once I would be able to enjoy my dinner without doing this and also for the reason which has prevented the Second Sea Lord, St John Tyrwhitt from being here tonight

He asked me to tell you that he was extremely sorry not to be here as he had some particularly pungent things to say to you So that those of you whose ears are tingling will know the reason why However we all hope that he will be soon back amongst us again I must, therefore extend my sympathy to you for having to listen to me rather than to the Second Sea Lord

" As M D G told you I was at one time Director of the Naval Staff College here at Greenwich During my time here there was one thing which particularly struck me other Branches of the Service also hold their reunions here the engineers the Electrical Branch the schoolies and the paymasters and I used to watch the Grand Square fill up with the ropiest of old cars as each of these reunions took place but it was not until the Royal Naval Medical Club Dinner took place that I realized which profession you had to follow to be able to afford really impressive cars I haven't had a look tonight but I expect it is much the same

"I must confess that I am surprised to find myself in the position of distinguished guest when there are present so many other highly distinguished personages—a personage being anyway more distinguished than a person

Now I do not intend to refer individually to any of the guests and I hope they will forgive me but I am sure that they would like me to thank on their behalf the President and Members of the Royal Naval Medical Club for inviting us here this evening for the excellent dinner and for the very warm welcome we have been given and also add a word of thanks to the Admiral President for allowing this dinner to take place in such wonderful surroundings as we have here

Having served in only two big ships as Medical Officer in the *Hood* [illegible] Captain of the *Vanguard* in 1953 and the rest of my time mostly in destroyers I have [illegible] I am sorry to say a large circle of friends amongst Naval Medical Officers You may think that there are other reasons for this but when I tell you that I have only spent an aggregate of 14 days in Naval Hospitals you will realize that I am not biased one way or the other Since dealing with the Reserves as A C R I have been simply stunned by the number of doctors and dentists which there are either serving or wishing to serve in the Naval Reserves It seems to attract them by the scores and I cannot believe that it is the gin as the Headquarters Ships of the Reserve do not get it duty free anyway It must be the unquenchable striving for freedom from the family clutches which drove our fathers and grandfathers to spend every evening of the week at their clubs The fact remains however that our lists of medical officers and dental officers are well filled in the Reserves and here I should like to say what an extremely valuable contribution they make to the activities of the divisions to which they belong not only in their professional capacity but in other activities as well I know of one who runs and plays in a pipe band and another who is in charge of all the recruiting of the division That so many doctors who lead an appallingly busy life anyway can spare the time to serve in the Reserves is a matter of great satisfaction to the Admiralty and great credit to them I wish I could say the same happy state obtained in the Royal Navy where as you have heard from M D G we are in a serious position Since National Service ended we have virtually had no volunteers joining the medical side We simply must find the answer to this problem Whilst I am delighted to hear of the increased payments which M D G referred to tonight and whilst I agree that the remuneration which one gets is a large factor in life nowadays I cannot accept that it is only a matter of increasing this sufficiently in order to attract the right numbers to the Naval Medical Branch There must be more to it than that

Now there is no doubt that the Navy has suffered from a widespread feeling out side the service that its future is insecure

This feeling generated from

(a) 1957 White Paper
(b) The Axe
(c) Talk of Nuclear Disarmament

and a general feeling of apathy towards the Armed Forces generally which always seems to develop in this country on the successful conclusion of a major war This feeling of apathy has been aggravated by the continuance of conscription service in peacetime a thing which has never happened in the history of this country before With the lapse of time since the end of the war and the cessation of National Service one hopes that things will improve and I believe that there are already distinct signs of this But I think we must look for a more fundamental reason which discourages young men who have qualified as doctors from joining the Royal Navy One of the reasons I am sure is that they think there is insufficient opportunity for exercising their professional ability There may be some foundation for this because anyway he will be living amongst one of the healthiest groups of people in the country and if he is in a ship conditions are such that as soon as a case becomes interesting the patient is whipped off to hospital If he is in a shore establishment other than a hospital he natur

[illegible] the junior staff and tends to acquire all the essential but nevertheless dull routine [illegible] connected with preventive measures inoculations and the like and examinations Putheems new entry and discharge routines There are in fact splendid opportunities for doing exciting work in the Fleet Air Arm in the field of nuclear biology and underwater physiology and research I am sure that today in the highly competitive market for skilled manpower the Navy must make it abundantly clear that young medicos if they have the ability can profit from their period of service in the Navy And there is no reason why they should become bogged down with routine matters but will have a real opportunity of showing their professional worth

Now it would be an impertinence for me to try and tell you how this can be achieved, all I can do is to draw your attention to the problem which as I see it is to find a means of ensuring that young men who join the Royal Navy as doctors are given such opportunities of practising their profession that when they come to leave they will find themselves able to compete with their contemporaries on shore on level terms and not at a disadvantage It may not be the same in the medical profession but there is no doubt that many employers in industry are becoming considerably attracted in the right sort of young man who has spent a short time five or seven years, in one of the Services I cannot refrain from adding particularly the Navy a young man who has had some experience of life seen some broader horizons and has acquired a more mature outlook than the public school boy or the university undergraduate and this I would have thought would apply equally in comparison with the medical student who goes straight into practice after qualifying Perhaps more important than anything else though in solving this problem is the necessity to convince those who are responsible for advising these young men and some I know are here tonight that there is a worthwhile career in the Royal Navy and also that the existence of the Royal Navy is still essential to the existence of this country and that it is likely to remain so during the lifetime of those who are considering joining it now

There are Teaching Hospitals close to most of the Reserve divisions which give an opportunity of providing a link between undergraduate and pre-registration doctors and the Service To improve this we are hoping to re introduce the Temporary Acting Surgeon Sub-Lieutenant R N R which existed before the last war

The idea being to enrol medical students give them some purely naval training in the Reserves division including I hope a period at sea and with the F A A with the idea that they will transfer to the Royal Navy on a Short Service Commission and possibly stay on and make the Service their career If this system is introduced many of you can help by indoctrinating suitable young men to join under these terms

I believe however that the most important aspect of all this is the rehabilitation of Short-Service officers who decide to return to general practice

It only remains for me to ask my fellow guests to rise and drink a Toast to the President and Members of the Royal Navy Medical Club

Reviews

SCIENTIFIC ASPECTS [illegible]. Edited by Hugh Garland [illegible]. Many black and [illegible] and several [illegible]. London: E. & S. Livingstone [illegible]. Price [illegible] 9d. Home Postage [illegible].

Contrary to [illegible] in and directing— a sort of Neurological [illegible] for physicians. [illegible] should be, for each chapter represents the [illegible] book is in fact a symposium [illegible] papers [illegible] may.

Sir Francis Walshe [illegible] investigations into the origins of [illegible] the subject is simpler than one might have [illegible] different aspects of [illegible] current theories of Aetiology and [illegible] the distorted [illegible] presents the implications of [illegible] tells tales of bizarre [illegible].

There are three fascinating [illegible] normal [illegible] thymoleptic [illegible] important in the book. [illegible] understanding [illegible].

Wylie McKissock [illegible] communicating [illegible] shock therapy for [illegible] was [illegible] deranged mind and reflex.

There are two chapters [illegible] the fascinating [illegible].

No doctor would dislike reading this book and [illegible] without learning something. Nevertheless, for most [illegible] 50s. that [illegible] better spent on [illegible] general and practical [illegible]. Medical [illegible] numbers of neurological cases will find [illegible].

W. B. W.

TEXTBOOK OF MEDICINE. Edited by Sir John Conybeare, K.B.E., M.C., M.D., Oxon., F.R.C.P., and W. N. Mann, M.D. (Lond.), F.R.C.P. 13th Edition. Pp. [illegible]. 989. 40 plates. Edinburgh and London: E. & S. Livingstone. Price 45s. [illegible] 3d. [illegible].

As indicated in the preface, it is primarily as a textbook for undergraduates that this work is published and it is as such that this new [illegible] edition must be judged, for it is insufficiently compact for the requirements of post-graduate students and [illegible] not carry enough detail to be used as a standard work of reference.

There are other textbooks which [illegible] better.

The medical student recognises a book which [illegible] all [illegible] and whose explanations are lucidly simple. [illegible] this book is excellent in parts. Representing as it does the independent work of 17 contributors it is inevitable that the style, pace and plenty must vary to some extent. The [illegible] who have expressed themselves briefly and readably in their [illegible] the book. The cardiovascular and central nervous systems are done thoroughly [illegible] containing all that is required by the student. The section on mental diseases [illegible] one of the highlights of the book. The [illegible] on renal diseases holds the attention well. A good deal of [illegible] the clarification of symptomatology, diagnosis and treatment. The remarks on Oedema are particularly well done.

In the dermatology section an unfortunate [illegible] every dermatological [illegible] without [illegible] each. Terminology is inadequately explained and the resultant reading would be heavy going for the student. For treatment [illegible] easy to [illegible] without some previous knowledge of diseases of the skin.

The section on [illegible] allowed some 10 pages. Worms and poisons were [illegible] fully [illegible]. Endocrinology is brief [illegible] and readable. The section on [illegible] dealings with acid-base [illegible] readability.

The book [illegible] the paper and [illegible] and there are [illegible] The diagrams are excellent [illegible] X-rays are less satisfactory [illegible] purpose they serve, since the examples presented would not help the student [illegible] except at a very advanced stage.

Certain [illegible] made the whole work worthwhile for me and at its relatively modest price the student will get his money's worth.

W. B. W.

HUMAN BIOLOGY. By John Gibson, M.B., Ch.B., D.P.M. Pp. 222 with 67 line drawings. London: Faber & Faber. Price 12s. 6d.

This is a remarkable little book and portrays the author as having a very profound knowledge of his subject and the needs of the young student nurse and pre-nursing student.

The subject is presented with a true simplicity which makes it a pleasure to read and the diagrams are clear and concise.

I feel this book should have a place in every school library as both boys and girls would get from it a simple but thorough knowledge of how the body works.

D. A. S.

DISC LESIONS AND OTHER INTERVERTEBRAL DERANGEMENTS. By E. J. Crisp, M.D., (Cantab.), D. Phys. Med. (Lond.). Pp. vii+158+illustrations. London and Edinburgh: E. & S. Livingstone. Price 15s. +11d. Home Postage.

This is not a book to recommend. The causes and treatment of low back pain will always excite discussion between orthopaedic Surgeons and others who are called upon to treat it, but this book does nothing to clarify an already difficult subject. Entitled "Disc Lesions" it is largely devoted to other less well defined symptoms, in some cases of rather nebulous pathology.

The general text is not easy to read, the illustrations are not up to the standard usually seen in a modern text book and I am a little puzzled by the author's reluctance to try similar forms of treatment for similar lesions at different spinal levels and by the scarcity of references to the published literature.

K. T. H.

OUTLINE OF FRACTURES. By John Crawford Adams, M.D. (London), F.R.C.S. (England). Pp. viii+268 illustrations. Third Edition. London and Edinburgh: E. & S. Livingstone. Price 27s. 6d. Home Postage 1s. 3d.

This is a good sound book.

In one small, compact volume John Crawford Adams has embellished his previous success in giving a clear outline of the commoner skeletal injuries and their management.

In his original preface he modestly suggests his book as a guide to students and physiotherapists but it must surely be read more widely, particularly by those residents whose duties include casualty work.

There is also an apology for the dogmatic text, but what better teaching is there than by a man of experience expressing his opinions in a concise, simple and straightforward manner, happily forsaking the clutter of confusing detail beloved of many writers.

Indeed, without being unduly radical one would find it difficult to destroy much of his text although I would not agree with his views on delayed union of fractures of the tibial shaft and their treatment.

Nevertheless, I enjoyed reading this book and the provocation of three editions in four years is witness to its wide popularity, together with its companion volume "Outline of Orthopaedics".

K. T. H.

PHYSIOLOGICAL RESPONSES TO HOT ENVIRONMENTS. Compiled by R. K. Macpherson. Pp. xv+323. London: H.M. Stationery Office. 35s.

This very welcome report gathers into one volume the work of a team of experts who, since 1944, have made a valuable contribution in climatic physiology. The primary object of the research, which was carried out at the Royal Naval Tropical Research Unit in Singapore and the National Hospital for Nervous Diseases in London, was to investigate environmental conditions in H.M. Ships in hot climates, and make recommendations for improvement.

The greater part of the work has already received limited publication in 40 or so reports by the Medical Research Council's Royal Naval Personnel Research Committee which this volume now presents in a consolidated form.

There are very few practical aspects of man's adaptation to a hot climate which are not covered by this report. The balance of temperature, humidity and air movement is considered with regard to man at rest, at various work rates and with various clothing. Artificial and natural acclimatization are examined in detail and an attempt is made to find a working index of climatic stress. In this respect the pros and cons of Effective Temperature Scales are explained and the advantages of the Predicted Four-hourly Sweat Rate presented. It is clear that the ideal index has not yet been found.

Account is also taken of the wide range of variation in the reactions of different individuals and an important distinction is drawn between the climatic limits which effect man's efficiency and those which effect his survival.

This is indeed a most comprehensive account with a wealth of detail and experimental data both in text and table. There is ample indexing and the careful arrangement of headings makes any subject readily accessible.

Following the preface and introductory chapter which give the background of the work, each chapter gives the names of the personnel responsible for the work described. This leaves the reader in no doubt that the whole publication is the result of efficient and co-operative team work.

There is still very much more to be done in this field but for many years to come this report is likely to be well read and quoted as a basic authority. S M

A SHORT MANUAL OF VENEREAL DISEASES AND TREPONEMATOSES. By Batchelor and Murrell. Second Edition. Pp. xvi + 316. Many black and white photographs and several coloured illustrations. London and Edinburgh: E. & S. Livingstone. Price 25s + 1s 2d Home Postage.

When the first edition of this manual was produced, ten years ago, it was mainly intended for members of the nursing profession, although a wider appeal was also anticipated. In the light of experience, the second edition has been prepared with a view to assisting the medical student and general practitioner. To this end, although the scope of the book has been extended, allowing for the social and clinical changes which have affected the subject during the past ten years, the authors have contrived to continue to present their views in a form which has lost nothing through being well condensed and maintained at a fairly elementary level. They are to be congratulated on a work which is easily readable, understandable and which presents the essentials of the subject in a form by which knowledge can be acquired without overmuch labour on the part of the reader. J L S C

We acknowledge with thanks receipt of the following publications

Alfred Hospital Clinical Reports Vol 10 1960. *Annali di Medicina Navale. Annals of Tropical Medicine and Parasitology. British Medical Bulletin. British Medical Journal. Bulletin of The World Health Organization. Guy's Hospital Gazette. Journal of the Royal Naval Scientific Service. Kyushu Journal of Medical Science. Medical Digest. Mid Medical Journals. Military Medicine. Montreal Medical. Naval Review. Proceedings of the Staff Meetings of the Mayo Clinic. Rivista Medica. Rivista Di Medicina Aeronautica E Spaziale. Suomen Laakarilehti. Terveellinen Akakauskirjat. St Mary's Hospital Gazette. The Australian Journal of Experimental Biology and Medical Science. The British Journal of Surgery. The Gunma Journal of Medical Sciences. The Journal of The Bowman Gray School of Medicine. The Journal of The Irish Medical Association. The Medical Press. The Tohoku Journal of Experimental Medicine. The Nuffield Provincial Hospitals Trust 1958 61. University of Durham Medical Gazette. Vestnik dermatologii i Venerologii. World Health Organization Chronicle. Yokohama Medical Bulletin*

News of the Service

OBITUARY

Surgeon Rear Admiral R [illegible] CORY died on the 10th May 1961 at the age of 75

Surgeon Rear Admiral [illegible] qualified M R C S and L R C P (London) and he entered the Royal Navy as a Surgeon Lieutenant on the 4th October 1912 He was promoted Surgeon Lieutenant Commander on the 4th October 1918 Surgeon Commander on 4th October 1924 Surgeon Captain on 30th June 1934 and to Surgeon Rear Admiral on the 10th January 1942

He was awarded the C B E in the [illegible] January 1941 (London Gazette Supp 1 1 41)

Surgeon Rear Admiral Cory was released from the Royal Navy on 19th October 1946 (medically fit)

Surgeon Captain Alfred Burridge COX died on the 8th June 1961 at the age of 81

Surgeon Captain Cox qualified as M B and B S (Edin) in 1903 He entered the Royal Naval Medical Service on the 23rd May 1904 as a Surgeon on the 23rd May 1912 he was promoted Surgeon Lieutenant Commander and Surgeon Commander on 1st June 1917 He was placed on the Retired list with the rank of Surgeon Captain on 10th July 1929 He was called up on mobilisation September 1938 as Medical Transport Officer His appointment was terminated on the 4th October 1938

Surgeon Commander Charles Clarke MacMILLAN died on the 22nd May 1961 He was born on 4th April 1873 and qualified as M B B S (Edin) in 1897

Surgeon Commander MacMillan entered the Royal Naval Medical Service on the 23rd May 1898 as a Surgeon He was promoted Staff Surgeon on 23rd May 1906 and Surgeon Commander on 23rd May 1914

He was awarded the D S O on the 6th November 1900 for service in the South African War (Gazette 6 11 1900)

Surgeon Commander MacMillan was placed on the Retired list on 20th January 1919

Surgeon Commander Richard CONNELL died on the 3rd June 1961 after a prolonged illness He was aged 80 years

Surgeon Commander Connell qualified B A M B B Ch L M (rotunda) Trinity College Dublin with honours in 1906 He entered the Royal Naval Medical Service on the 14th May 1907 as a Surgeon gaining a gold medal for surgery in the same year He served in H M S *Swiftsure* in 1909 Received thanks of the Admiralty for services during the massacre of the Armenians in 1909 Promoted to Surgeon Lieutenant Commander on 14th May 1914 and Surgeon Commander on 30th May 1918

Surgeon Commander Connell was appointed to R N H Haslar in 1917 21 in charge of radiology and electro therapy departments

He was placed on the Retired list (medically unfit) on the 11th March 1921 and appointed [illegible] Radiologist to the Cumberland Infirmary which post he held until 1946 He was also [illegible] Dumfries and Galloway Royal Infirmary and Workington Infirmary Gained [illegible] F R in 1932

HONOURS AND AWARDS

Commander of the Order of the British Empire

Surgeon Captain W J M Sadler M R C S L R C P

Officer of the Most Excellent Order of the British Empire

Surgeon Commander E S Elliott M A B M B Ch M R C S L R C P

HIGHER DEGREES

F R C S (Eng)—Elected *ad eundem* Surgeon Rear Admiral D D Steele Perkins C V O F R A C S D L O

F R C S (Eng)—Surgeon Lieutenant J B Drinkwater

B D S —Surgeon Lieutenant (D) D S White

PROMOTIONS

The following provisional [illegible] have been accounted for promotion to date 31st December 1961

To Surgeon Captain—J P T Wellwood M B B Ch J F Meynell M R C S L R C P D A M F Sheehan M B B Ch J W Walker O B E M B Ch B

To Surgeon Captain (D)—K I J Fletcher L D S

To Surgeon Commander—E H T Warburton M R C S L R C P R H Broughton M D Ch B M R C S L R C P F C S Pearson, M B Ch B

To Surgeon Commander (D) M E P Easton L D S G J Boyd F D S

TRANSFERS TO THE PERMANENT LIST

Surgeon Lieutenant R J Morrow

ENTRIES FOR SHORT SERVICE

Actg Surgeon Lieutenant J M F Hartley Actg. Surgeon Lieutenant (D) M W Blake

Re-entries to Short Service—Actg Surgeon Lieutenants D P V L Giles and J R Seel

RETIREMENTS

Surgeon Rear Admiral G Phillips C B Q H S M B B Ch D L O

Surgeon Captain L G Yendoll L M S S A

Surgeon Captain M A Rugg-Gunn M D Placed on Retired list (own request)

Surgeon Lieutenants J B Gill J D Wrighton R F Fountain J Knowles and D R Potter Released on completion of Short Service Commission

Surgeon Lieutenant J M D Galloway Released from Short Service Commission (Own request)

Surgeon Lieutenants (D) D F J Chapman Andrews and B R Bowles Released on completion of Short Service Commission

WARDMASTER OFFICES

HONOURS AND AWARDS

Member of the Order of the British Empire

Wardmaster Lieutenant Commander W Jones

PROMOTIONS

Confirmed in the rank of Wardmaster Sub Lieutenant—T R Clarkson

QUEEN ALEXANDRA'S ROYAL NAVAL NURSING SERVICE

R R C—Miss O M Molyneux (Superintending Sister)

A R R C—Miss M S Fetherston Dilke (Superintending Sister)

PROMOTIONS

To Senior Nursing Sister—Miss P Gammer and Miss F R James

RETIREMENTS

Miss M A Griffiths (Superintending Sister Serving as Matron)

Miss E N G Gill (Superintending Sister Serving as Matron)

Miss D A Stoy (Superintending Sister)

Miss X F Andrews Senior Nursing Sister

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435.—Medical Stores

478.—Travelling—Naval Personnel and their Relatives—Concessions Granted by British Railways

526.—Passages by Air—Rules for Wearing Uniform or Civilian Clothes on Overseas Duty Flights.

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ALVERSTOKE HAMPSHIRE

PART IV A CONCISE TREATISE ON MARINE SCIENCE

Chapter III—An Ecological Study

By Surgeon Commander J GLASS R N

The study of the relationship between life in its environment is that of probing scientific natural history This ecological pursuit is the crossroad of many fields of science

Part One

Physics of the Sea—of gravity temperature pressure light and sound

A great influence on the oceans is gravity The surface of the sea is not at all one level, but is pulled by the force of gravity towards the higher parts of the landed continents and by the great gravitational pull exercised by the sun and moon which as we know causes tidal changes

Barometric pressure the measure of the weight of the air at any one place at a given altitude and time is by no means constant even though the one factor of altitude over oceans over the world remains basically the same Deep depressions and areas of high pressure arise which influence the weather reports of events to come

The oceans sustain five main areas of constant average high pressure Two in the Northern Hemisphere and three in the Southern All are in the middle latitudes One with its centre near the Azores with an average pressure exceeding 30 2 inches in July and 30 05 inches in January Two others are over the Pacific west of California and Valparaiso Another is in the mid-Atlantic opposite and off South West Africa The fifth is in the Indian Ocean south east of Madagascar These centres practically control the oceanic wind system which is the feature of the force behind the surface water currents Thus in these five areas light inconstant winds occur and at their margins air streams outwards in all directions Between the northern and southern high pressure areas are the equatorial regions and they have relatively light constant air currents which stream equator wards the Trade Winds These winds would flow due south or north towards the Equator if the world did not rotate on its axis The rotation of the earth makes a point on the Line move more rapidly than one nearer the Poles so that any object which is travelling equator wards must be diverted more and more to the west owing to its initial speed of rotation For this reason the Trades come from the north east and south-east and are named accordingly

In the Atlantic these steady winds have a much greater velocity south of the Line than north of it The mean velocity of the south eastern Trades is 25 30 miles per hour and that of the north east Trades is 14 18 miles per hour The wind velocity over open sea is about four to five miles an hour greater than the velocity near to land The Antarctic is another area of constant high pressure and between this area and the oceanic areas is a world wide belt of lighter air into which winds rush incessantly

[illegible] the earth is deflected eastwards because it [illegible] and therefore comes from the west or north west [illegible] the Roaring Forties

The areas of highest salinity coincide with areas of high atmospheric pressure i.e. the permanent sub tropical anti cyclone regions where the prevailing clear skies and light winds allows for active evaporation to take place The strong and sustained north-easterly and south-easterly Trade Winds blow towards these areas

In the Western Atlantic for example the saline waters from the equatorial belt flow to higher latitudes by the Gulf Stream and the Brazil Currents while in the east the Kuroshwo and East Australian Currents form in the Pacific Between the two sub-tropical areas where the salinity state is high there is the Doldrums belt a seasonally migrating boundary between the north east and south-east Trades, where salinity is low This region is usually an overcast area of frequent showers which dilutes the surface water

The ocean dominates the air and the temperature of the air is intimately related to atmospheric pressure Where the air is cold pressure tends to be high while warm air favours low pressures The transfer of heat between ocean and air therefore alters the direction and strength of the winds and directs the storm systems on their paths

Water requires a tremendous amount of heat energy to raise its temperature It takes 3 000 times as much heat to warm a given volume of water one degree than to warm an equal volume of air by the same amount The heat lost by a cubic metre of water on cooling 1°C would raise the temperature of 3 000 cubic metres of air by the same amount i.e. a layer of water a metre deep cooling one degree could warm a layer of air 33 metres thick by 10°C

The sea is the storehouse of the earth's heat as we know that in winter in U.K. the sea is far warmer than the air

The heat received at the sea surface is imperceptibly slowly conducted away into deeper layers and we know that with increased depth there is a decrease in temperature The effect of the sun's heat is not felt to a greater depth than 300 fathoms The heat rays are rapidly absorbed by the upper few inches and any warmth transported to deeper layers is by mixing through currents

There is a lag in seasonal changes Whilst in U.K. June may be a hot month the water does not reach maximum temperature until August It is even slower for deeper water—at 50 fathoms the water is hotter in December at mid-winter and is coldest in May or June Below 100 fathoms there is no seasonal change in temperature of the sea year in and out and only falls gradually in the deep into the abyss where it remains about the freezing point all the time

Fresh water is lighter than salt water and ice as we know is lighter than fresh water When sea water freezes then the ice contains practically no salts and so when melted down is drinkable

The freezing point of sea water is not definite as the temperature scale when ice crystals form varies with salinity During ice formation fresh water leaves the sea and the remaining unfrozen water has a higher salt content, and this situation in turn lowers the freezing point If the temperature continues to drop then block ice forms containing salt crystals

Rising temperatures reverse the process As the heat rise thaws the ice and liquifies it the remaining ice takes up the heat and more heat is necessary to cause further melting

As it becomes solid the sea expands and becomes oddly enough less dense when it changes from its normal liquid form This fact would soon alter the face of the earth if it were otherwise and ice sank to the depths of the sea rather than float, as it became solid The Polar seas would very soon be one great frozen mass Without oceans the dark side of the planet would come close to freezing at night

The temperature of sea water rarely falls below −1 5 C anywhere at any depth or at any season whatever the air temperature, since the ocean is a vast circulating fluid body of high specific heat

Pressure has a distinct yet errious influence on temperature A water sample having a temperature of 2 C at 8 000 metres when brought to the surface will without added or subtracted heat lose 1 C Deep water would then have higher temperature except for the pressure to which it is subjected

Temperatures and depths are factors of great importance, controlling vertical distribution of sea life from shallow into deep water Owing to decrease in temperature, the "horizontal" differences become less and less as the water gets deeper Thus we see similar sea life at great depths in the polar and equatorial regions because the temperature is the same, while sea life found in shallow waters of temperate seas has relatives living in deep waters with the same temperature in the tropics

The compressibility of the vast oceans of the world is relatively slight However if this downward compression was absent by the alteration of natural law the sea level would rise over 90 feet all over the world

The noted Swedish Oceanographer Otto Pettersson presented theorems of the variations of climate being dependent on the dynamics of water movements in the deep sea and solar activity (Carson 1956) He linked the movements of great submarine waves and the daily tides—which led to reasons for migrations of fish shoals He found that submarine waves varied in height and power as the tide influencing power of the moon and sun varied Linking astronomical calculations he disclosed that in our time the tides were at their greatest strength during the closing centuries of the Middle Ages When the sun moon and earth came into position at the time of the winter solstice they exerted the greatest possible attracting force on the sea and that once approximately in 18 centuries do the celestial bodies assume this particular relationship Piecing these findings together he evolved the theory of climatic variation—whereby alternating periods of mild and severe climates corresponded to the long period cycles of oceanic tides It is known that the world's recent period of most severe climate and maximum tides occurred about the year 1433 and that a minimal tidal effect prevailed about 550 A D By these calculations it would appear that the same minimal affair would occur again about the year 2400 and the maximum phase again in 3300

The ancient sagas tell of voyages of explorers about the 10th century when northern waters were apparently free of ice blocks and of Norse Viking settlements in Greenland where cattle pastured and fruit orchards thrived These villages were later to be buried under ice in the 13th century when climatic conditions began to deteriorate

The Greeks had abandoned the cold on the continent itself the region of cold climate result in Southern Europe

By the calculated decline of 18 centuries in era of cold and storm should have occurred about the third or fourth century B C It does exist in folk lore the Gothic dammerung Pytheas northern voyage in 330 B C and the migrations of the tribes of northern Europe who shook the Roman Legions and by the altered trade routes which were shifted back further east

These figures are given for the major disturbances of polar invasions There are other minor periods of tidal cycles which produce climatic variations of shorter periods and of less drastic consequences i e over 9- 18 or 36-year periods In 1903 there was a great release of polar ice in the Arctic Again in 1912 another release of polar ice took place into the Labrador current the year of the *Titanic* disaster

From 1930 a definite less frigid change in Arctic climate has been noted and this warming is at present spreading into the sub arctic and temperate regions The icy top of the world is getting temperate Norwegian Alpine Alaskan, Central Asian and East African glaciers are retreating and shrinking The northern sea water temperatures are getting higher evidenced by fishing fleets which are pursuing shoals further and further north The tendency for the next four centuries then is a move into a general phase of warmer and milder weather

Viscosity

Sea water as a liquid varies in fluidity under different conditions Warm water flows more readily than cold Thus the viscosity of water the resistance it has to change of form or movement is due to the combined effect of the qualities of adhesion and cohesion among the particles of water Viscosity of sea water is moderately relative to salinity but varies greatly with temperature A drop in temperature say from 25°C (77°F) to 0°C (32°F) nearly doubles the viscosity This change is not uniform and the increase per degree of lowering temperatures is greater at the lowest temperatures Thus objects may sink more rapidly in surface waters than at depths This inverse correlation of viscosity with temperature causes the viscosity of sea water, unlike its salinity to vary materially with season This also changes the forms of sea life not only for individuals but often in successive generations The random movement of molecules of water causes an interchange of molecules between adjacent layers and conditions exist where masses of water pass from layer to layer a turbulence phenomena and dynamic eddy viscosity which is effective in both the horizontal and vertical planes

Coker (1947) noted that high pressure only slightly reduces the viscosity of water, to about the same extent in reverse of its effect on the specific gravity which is only slightly greater by 1 75 per cent with an increase of 400 atmospheres

Light which supplies energy for plant photosynthesis and is necessary for vision is responsible for the colour and adaptive hues of animals and plants The characteristics of light important to life of the sea and which can act separately or jointly are (1) Intensity and (2) Quality

(1) *Intensity* decreases with depth and some sea animals have photoreceptory that

react solely to light intensity and plants have [illegible] reaction for photosynthesis when light intensity diminishes

(2) *Quality* of light or colour depends on different wave lengths and the colour of any object depends on the differential absorption of some wave lengths and reflection of others From the sea surface down to the depths the quality of light diminishes due to opacity of water

The most immediate effect of light on the sea surface is reflection and in a calm sea about 3 per cent of light is reflected and never enters the sea

In rippling waters about 15 per cent is reflected and in rough waters about 30 per cent

The sea as we have already noted is also divided into three zones on the basis of light *Intensity*

(A) *Euphotic Zone*—the range of depth is from 0 250 feet where depth is determined by clarity of water The Sargasso Sea as noted is the clearest of sea water Sea water is generally more transparent than fresh water Photosynthetic plankton is abundant to a depth of 150 feet

(B) *The Dysphotic Zone*—from 250 feet to a level where light completely fades This is a zone where sea life is adapted to dim light The level of light dispersed varies from 600 feet to 5 600 feet depending on water clarity and the angle of incidence of light The depth of this zone is greater at the Equator than at the Poles Sea animals here frequently have large eyes for vision in the feeble light Animals with luminescent organs become common and herbivores become scarcer In clear water light intensity at 3 000 feet is 1/3 000 000th of its intensity at three feet.

(C) *The Aphotic Zone*—no light exists Many sea animals are bioluminescent which serves for food finding or for defence Eyes of habitants here are very much reduced in size or even absent while carnivores and detritus feeders prevail

Depth of water affects the *Quality* of light Zones are not ascribed to changes noted in wave length differences in absorption In clear waters the long wave lengths or red colours are absorbed first and the short wave lengths the purples are absorbed last Plankton filled waters reflect red and yellow light waves and therefore appear green

Changes in light quality cause the colour of sea life to vary as well Many nocturnal animals are red and deeper in the Dysphotic Zone where red is lacking they are red as well However at this depth the fishes and crustacea so coloured, appear black as there is no red wave length to reflect In the Aphotic Zone these red animals are no longer seen and the inhabitants are brown black or transparent In summary then red coloration is an adaption to waters where red wave lengths are weak or absent and that it acts as a protection for the animals of nocturnal habits or in the dimly lit zones If it is queried why animals are red at depths where red cannot be seen by human eye the answer is that it should not be assumed that sea animals see as we do These creatures living in the waters of dim light have capacity to see objects that we cannot see and that to these animals red objects are probably protectively coloured This subject will be discussed further in Part Three of this chapter

Because of the large variations in reflection and opacity at the surface coupled with the light and shadows of the clouds that are always present somewhere the lower limit of diffusibility varies to some extent In addition the shadows creep up to the

surface each night Because of this diurnal change many fish dwelling in the zone from 600 to 1 000 feet down during the day, will follow the dusk upwards Many are thus caught at the surface at night by tow nets

Sunlight is absorbed in seawater and the red rays of the sunshine spectrum, as noted are removed in the first few feet of water The green and blue rays penetrate further to give sea water its characteristic appearance

Smith (1939) quotes the findings of Poole and Atkins in 1931-1933, off Plymouth when they showed that 90 per cent of white light was absorbed at 26 to 30 feet Below this the remainder greatly diminished and at 114 feet only 1 per cent remained Different colours were absorbed at different depths Red lost 90 per cent of its strength at 16 5 feet from the surface green penetrated to 43 feet

Results from the Michael Sars expedition off the Azores in 1910 noted that at 330 feet light strongly affected photographic plates although red rays were weak At 1 640 feet the blue and violet rays were still present on exposed plates At 3 280 feet only violet or ultra violet rays remained after an exposure of 80 minutes At over a mile down, 5 600 feet there was not the faintest trace of light on exposure of plates for two hours

Ray and Champi (1958) noted the loss of colour for underwater photographic purposes in the sea world to be at three to four feet depth the red began to disappear and at 15 feet so little was present that filters were required Orange left at about 30 feet and yellow at 65 feet Below that only green and blue remained until at 1 800 feet all visible light to the human eye disappeared Blue light not perceived by the human eye persisted beyond 1,800 feet This feature was described by Beebe in his Bathysphere dive when he noted a strange bright, blue light at that depth

Exposure of colour photographic plates for long periods showed that all wave lengths were present in clear sea water at 300 feet with the red wave lengths very weak At 1 500 feet red and green were absent

Russell and Young (1944) noted an observation of penetration of sunlight in the Atlantic Ocean conditions mid day June 35° 7 West 31 20 North lower limit of bulk of plant life was 650 feet

At 3,280 feet, photographic plate blackened after 80 minutes exposure At 5 578 feet plate not affected after 120 minutes exposure

Sound

Sound in the sea travels at approximately 1 500 metres per second (four to five times the speed in air), and away from source intensity, falls off inversely as the square of the distance It is further reduced by being absorbed as it travels The degree of absorption increases with frequency which is small compared with absorption of sound of same frequency travelling through air It is not surprising then that many fish have developed means of producing sound as a means of communication

The possible ecological significance of sound in the deep ocean might hinge about ideas of echo sounding. A fish swimming 1 500 metres off the bottom would sense an echo two seconds after call and this could be a means of orientation in an environment devoid of light which guides fishes living in the regions above 1 000 metres Another idea may be recognition signals to help the sexes to come together as in

some cases only the males have the means of making sounds by skeletal or swim bladder musculature

In the Atlantic the temperature drops rapidly from surface to depth until about 1,300 metres and then remains fairly constant to the deep sea floor As the temperature falls so does the velocity of sound, however from 1 400 metres downwards the speed of sound greatly increases again due to the increased hydrostatic pressure Thus a great sound wave channel is formed with its axis about 1 300 metres acting as a corridor for sound which will travel by successive reflections from its floor and roof as long as the inclination of sound is less than twelve degrees Here quite small sounds will travel great distances centred about the axis of the channel Marshall (1954) notes that one remarkable example of this was of the sound of a six pound charge exploded in the deep at Dakar being picked up at Eleuthera Island in the Bahamas over 3 100 miles distant

A report in the *New Scientist* of 28th July 1960 notes that a sea bed seismographic study test was planned by a team of oceanographers from the Lamont Geological Observatory of Columbia University New York and took place early in August 1960

The object was to drop the seismograph in a casing, a 14-foot long rocket shaped affair which embedded into the sea floor sediment at 18 000 feet when released from the parent ship. about 150 miles west of Bermuda

This inner seismograph designed to respond to vertical vibrations contained a mechanism producing electrical signals which when amplified were used to modulate a carrier signal set at 12 kilocycles per second The carrier signal then produced acoustic waves in the water which were picked up by the parent vessel and analysed

The parent research ship *Grace* a two-masted sailing yacht was ideally suited for this type of observation as it was free of interfering engine noise during measurement checks The *Grace* worked with another vessel the *Sir Horace Lamb* a converted minesweeper whose purpose it was to drop depth charges at a selected distance from the seismograph while the *Grace* sailed about over it, recording the returning signals

Investigations by this means have the advantage when the seismograph is put on the sea floor of an ideal situation of quiet and the arrival of weak seismic waves can be readily detected

Objectively, the early experiments were arranged to learn more of the structure of the earth's crust under the sea floor It was envisaged that other observations could arise from this study by monitoring stations about earthquakes or more important nuclear explosions, since man-made or other vibrations can mask the minute signals and then be detected by the sensitive instruments

Part Two

Physical and Organic Chemistry of the Sea and Deep Sea Floor constituents salinity chlorinity and specific gretuti

The ocean is not a uniform solution of water some parts being more salty than others as well as being warmer or colder The salinity range varies from the Polar seas the least salty to that of the Red Sea which is the saltiest and which contains a salt content of about 40 parts per thousand The saltest ocean is the Atlantic where the salinity in the north is about 33 parts per thousand and in the Sargasso Sea it is about 36 parts per thousand

For the s[illegible]ations the figure of 166 million [illegible] tons [illegible] salts is stated [illegible] cubic mile of sea water This figure over t[illegible] increases for the earth is subjected to a shifting of her component materials and this shift is heaviest and constant towards the sea.

The first seas were only faintly saline to start with and when the first rains came which fell century after century from the enveloping clouds of the new earth the beginning of the washing and wearing away action carried these minerals to the forming seas

At present it is known that calcium enters the sea at a proportion four times greater than chloride and yet the sea proportion is 46 times more chloride than calcium The difference is the calcium uptake in the sea by marine animals for their skeletons and shell structures—from the microscopic foraminifera to the shells of molluscs and then to the massive coral reefs Calcium as well is precipitated as a carbonate Silica too is 500 times greater in rivers than in the sea Diatoms use the silica to make their shell structures Thus the needs of the flora and fauna of the sea consume the chemical materials poured into the sea so that only a small part of the salts brought in goes to increase the dissolved mineral quantity in the sea Any further inequalities are lost when the heavy river water concentration becomes dispersed in the vast volume of sea amidst the constant flow of water added to it

From the sea bed on the deep sea floor submarine volcanoes discharge chlorine iodine boron and sulphur into the waters above it Some return to the land is made by the harvesting of sea plants and animals for food fertiliser or chemical products of industry but it is only a temporary loan and after use goes back again to the sea

One key to the dynamics of the sea is the fact that sea water is a chemical mixture of evaporable water and heavier non-evaporable mineral substances Thus it is not a pure water

The ocean contains a salt content which rarely exceeds 3 8 per cent and rarely less than 3 3 per cent Nine different ions compose 99 5 per cent of the salts in solution and these ions are fairly constant in proportion one to the other

There are some 50 chemical elements present in sea water seven are major constituents the rest are present in varying degrees and some are not found in sea water by analysis but in the tissue of sea animals or plants which use them for some physiological function

Major Constituents — *One Average Calculation*

	Parts per thousand of sea water	*Percentage of total salts*
Sodium chloride	27·21	77·8
Magnesium chloride	3·81	10·9
Magnesium sulphate	1·66	4·7
Calcium sulphate	1·26	3·6
Potassium sulphate	0·86	2·5
Calcium carbonate	0·12	0·5
Magnesium bromide	0·08	

Salts dissolved in water behave as if they were dissociated into component radicals positive and negative ions

Another Average Calculation

Positive Ions—Metallic or Basic Radicals	*Parts per thousand sea water*	*Percentage Composition*
Sodium	10 77	30 4
Magnesium	1 30	3 7
Calcium	0 42	1 2
Potassium	0 38	1 1

Negative Ions—Acid Radical	*Parts per thousand sea water*	*Percentage Composition*
Chloride	19 37	55 2
Sulphate	2 71	7 7
Bicarbonate	0 097	0 35
Carbonate	0 007	
Bromide	0 0006	0 19

The salt content of sea water is expressed as Salinity or S‰ the convention which notes the weight in grammes of dry salts in one kilogramme of sea water With this knowledge the concentration in grammes per kilo of the nine ion components has been calculated It is expressed as a 35 00 S_{00} water which is 0 56 molar and 80 per cent of the salts behave as if dissociated (indicated by the freezing point −1 9 C) Thus the water is isotonic with 1 0 molar solution of an undissociated compound

The specific gravity is calculated from the salinity and the temperature and also determines its composition in terms of grammes per litre

The principal constituents which concern us again are noted

	Ocean Salinity 35‰ Grammes per Kilo	*Grammes per Litre at 20 C Specific Gravity 1 025*
Sodium	10 77	11 1
Chloride	19 37	19 8
SO_4	2 71	2 76
Magnesium	1 30	1 33
Total Salts	35 1	36 00

By definition *Salinity* of water is the weight in grammes of solids obtained from water weighing one kilogramme when solids are dried to a constant weight at 480 C and the quantity of chloride and bromide lost being allowed for by adding weight of chlorine equivalent to the loss of the two halides during drying

Chlorinity is the mass of chlorine equivalent to the mass of halogens contained in 1 kilogramme of sea water precipitated by a silver salt associated with titration precision The precipitant being silver chloride and bromide with a minute trace of iodide

[illegible] bromite indicators sodium fluorescein and [illegible] end point or by an electric conductivity measurement [illegible] methods which prove simple and accurate For easy laboratory chlorinity and salinity determinations titration of 10 ml of sea water with a solution containing 27 25 G of silver nitrate per litre is used and the burette volume reading in millilitres roughly equals the salinity of the sample

Knudsen's formula relating salt content to chlorinity states

$S‰ = 0\ 03 + 1\ 805\ Cl‰$ (when a standard of specially prepared 'normal' water is used)

Ommanney (1955) noted that one of the salient findings of the *Challenger* expedition which recorded the surprising fact at that time that although the concentration of solution of sea water varied in different areas the proportions in which the different ions of elements exist to one another vary very little from seas containing 40 parts per 1 000 or 14 parts per 1 000 This useful characteristic he added, is the means of calculating the amount of any other component, as well as the salinity knowing the amount of one constituent

An electrically operated salinity meter was developed by the National Institute of Oceanography capable of measuring the salinity to an accuracy of ± 10 003 parts per 1 000 or one part in 10 000

Notes on Major Constituents

A recent rapid determination of sodium to chlorinity has been found directly by precipitation with zinc uranyl acetate and the calculation is 0 56 Magnesium is precipitated with 8-hydroxyquinoline When the hydrogen ion concentration falls and Ph rises above nine $Mg(OH)_2$ separates as a precipitate with $CaCO_3$. Cox (1959) describes how determinations of the trace elements and substances of very low concentrations are undertaken within the limitations of ship's laboratories He notes that colorimetric measurements are practical under such conditions and that absolute care in techniques is required to avoid contamination of samples

A Table of Concentration of Elements in Sea Water of Salinity of 34.33 parts per 1,000 (in order of abundance)

Element	*Concentration in mg/kg (Parts per million)*	*Element*	*Concentration mg/ton (Parts per thousand million)*
Chlorine	18 980	Arsenic	10–20
Sodium	10 561	Iron	0–20
Magnesium	1 272	Manganese	0–10
Sulphur	884	Copper	0–10
Calcium	400	Zinc	5
Potassium	380	Lead	4
Bromine	65	Selenium	4
Carbon	28	Cesium	2
Strontium	13	Uranium	1 5
Boron	4 6	Molybdenum	0 5

Element	*Concentration in mg/kg (Parts per million)*	*Element*	*Concentration mg/ton (Parts per thousand million)*
Silicon	0–4·0	Thorium	0·5
Fluorine	1·4	Cerium	0·4
Nitrogen	0–0·7	Silver	0·3
Aluminium	0·5	Vanadium	0·3
Rubidium	0·2	Lanthanum	0·3
Lithium	0·1	Yttrium	0·3
Phosphorus	0–0·1	Nickel	0–1
Barium	0·05	Scandium	0·04
Iodine	0·05	Mercury	0·03
		Gold	0·006
		Radium	0·0000002

Specific Gravity

Specific gravity of sea water is the ratio of its weight to that of an equal volume of distilled water at 4° C. noted as 0. If then 1·027 is the specific gravity of sea water at t°C. this is expressed as 0·t – 26·53. The specific gravity of sea water is proportionate to its salinity yet the measure of the two quantities are not identical as specific gravity varies slightly with temperature changes and more so with pressure at depth. It is higher at greater depths where the pressure is also linked with lowered temperature.

Dissolved gases differ widely in proportion and this is due to the activity of organisms and the effect of the amount of sunlight, plant life and temperature of the sea water.

Just as oxygen and carbon dioxide are vital to physiological processes of land animals...so do these substances play their important roles in the functions of sea life. Even anaerobes get their oxygen second-hand in order to survive.

The other important gas is nitrogen which occurs in sea water in a smaller ratio compared to other gases above the sea surface. In air it is 78 per cent and in the sea it is 64 per cent of dissolved gases. Elemental nitrogen in the sea has no real biochemical significance *per se* but when the nitrogen—fixing bacteria react it is used for the formation of nitrates and ammonium salts. This arrangement does not apparently flourish in the so-called economy of the open sea.

Gases are more soluble in colder water and more so as well in fresh than in salt water. Hence the proportions of gases dissolved in the ocean differ greatly in different regions. The cold Polar seas absorb more air than the warmer, saltier tropical seas. The quantity of absorbed air diminishes on descent into the depth of the sea, and at the same time the proportions of gases change. The amount of nitrogen remains unaltered and oxygen diminishes.

Oxygen in solution is about a fifth less soluble in sea water than fresh water. However it is absorbed in sea water proportionate to other gases to a greater degree than in air i.e. 34 per cent compared to 21 per cent in the atmosphere.

The percentage absorption applies at the surface with a salinity of 35‰ and a temperature of 10° C.

In some [illegible] it may be as much as 75 per cent saturated with [illegible] oxygen than upper layers Coker (1947) quoting Sewell stated that the minimum concentration of oxygen in the western region of the North Atlantic is between 200 and 900 metres deep with values ranging from 1 7 5 0 c c s per litre and that Vaughan recorded in the Eastern Pacific at a depth between 600 1 200 metres a layer of water which was 5 per cent saturated with oxygen while below that the maximum saturation could range between 30 per cent to 40 per cent.

As the temperature rises solubility of oxygen per c c per litre decreases in a steady curve

The oxygen capacity of temperate zone water is thus higher than that of the warmer latitudes

Solubility of Oxygen at Different Temperatures at Surface Atmospheric Pressure and Salinity 35‰

Temperature	*Oxygen in c c per Litre*
0°C	8 03
10 C	6 40
20°C	5 35
30°C	4 50

Carbon dioxide makes up about 0 03 per cent of the atmosphere but as its solubility is some 50 times greater than that of the other gases its proportion by weight in solution is approximately 1 6 per cent of all dissolved gases

In the sea carbon dioxide presents in many forms

(1) CO_2 in solution
(2) As H_2CO_3 undissociated carbonic acid in minute quantity
(3) As the radical HCO_3 dissociated carbonic acid
(4) As the slightly soluble carbonates
(5) As the more soluble bicarbonates

The carbonates and bicarbonates exist due to the calcium magnesium and other bases which are present in sea water in greater amounts than the equivalent of stable acid radicals This excess base forms the 'alkali reserve' which maintains a reserve of carbon dioxide for plant life The amount of CO_2 in solution although measured in tenths of a c c in a litre of sea water is present in the proportion of 45 50 units compared with five to ten units of oxygen Two thirds of the excess base is present as the bicarbonate and this substance being unstable yields CO_2 to plants when it is required

CO_2 plays a small part affecting the acid-base equilibrium of sea water which favours the uniformity of sea life environment Generally sea water is very slightly on the alkaline side of pH readings The degree of alkalinity varies with seasons of year and time of day Plant life being most active in bright sunlight at mid day in warm weather uses CO_2 for photosynthesis and as the carbonic acid decreases the pH shift is alkaline On the other hand, we can expect under mid-winter conditions at night when CO_2 is released in respiratory functions, the sea to become less alkaline

A question is raised by Coker (1947) to the mystery of some carbon dioxide concentration below the range of utility by plant life in the ocean say at 1 000 metres

[illegible] dissolved minerals [illegible] entirely adequate explanation [illegible]

The food of sea plants consists of simple inorganic chemical substances i.e. nitrates phosphates carbon dioxide and water With the component of chlorophyll or some related pigment in the presence of sunlight these simple substances are converted into complex substances i.e. sugars starches oils and nitrogenous compounds like protein from which living protoplasm is formed and built up Thus whilst sea animals convert one form of life into another plants manufacture life itself

The really vital salts of the sea are these nitrogen salts nitrates and nitrites Nitrogen is essential for building up the proteins of the nutrient intake These salts once in the sea are used by plants in the shallow water zone of nitrogen utilization Sea animals eat the plants and nitrogenous protein is redistributed When these animals die they sink and bacteria convert the tissue into nitrogen compounds which are released in the deep water zone of nitrogen regeneration The salts accumulate in the depths and at some time are swept to the surface by currents where upwelling occurs This rich fertilizer once again available to plant life commences another phase of the cycle

The *phosphorous* story is similar where a zone of phosphorous utilization and regeneration occur, and where finally phosphates are brought to the surface to commence its new cycle

These nitrogen and phosphate compounds are not inexhaustible and where the quantity of these nutrients are scarce then limits to the amount of sea life supported are set Nutrients become scarce in summer in the temperate zones as the more abundant sea life uses them up When cold weather returns, this sea life dies and nutrients return to the depths This then is the second cycle the Seasonal Cycle

The Nansen reversing sample bottle used by investigators in the R R S *Discovery II* brought up deep sea water samples for early chemical analysis It was considered by them that rapid analysis was important in order that the concentration of the nutrient salts would not change on storage due to absorption by organisms or by their decomposition when dead It was also believed helpful to plot these early results as the trip proceeded and to watch for early unexpected variations (Cox 1959)

Calcium is important as well and in the sea exists to a great extent as calcium sulphate About four per cent of salts are calcium compounds and they are used by sea animals for their skeleton structures As the coral sponge crustaceans molluscs and foraminifera precipitate the soluble calcium to form the relatively insoluble calcium carbonate at the optimum temperature of 75 to 80 F it is evident that tropical waters will have an abundance of coral reefs and large mollusc dwellers

Silicon to a somewhat lesser degree is used in the same way by the smaller creatures radiolarians diatoms and sponges

There is a distinct correlation between river deposits of salts and abundance of life The Atlantic receives a lot of river drainage and the continental shelves hold these deposits which explains the comparative richness of life in these waters The Pacific with less shelf owes its richness in some areas to upwelling

As chemists the plants and animals of the sea are admirable. They are able to find and utilize elements only found in minute traces which at present are detected by intricate spectroscopic analysis.

Vanadium has been found in the blood of holothurians and ascidians. *Cobalt* and *copper* in relatively large amounts are extracted from the sea by lobsters and mussels. *Nickel* is found in various other molluscs. Copper, for example, acts in lobsters in the same way as iron does as a respiratory pigment in our blood composition, and yet it is only recoverable as one part in 10 000 of sea water.

There is difficulty in extracting sea salts or elements in quantities for commercial purposes from the sea, despite the varied and vast store it contains.

Iodine is found in almost every marine plant and animal, and as we are well aware some varieties of seaweed contain great amounts, yet it is a scarce element in sea water and difficult to detect or analyse. It would appear then, that it is in a state of constant chemical change—being oxidized, reduced or held as part of an organic reaction.

Ninety nine per cent of the world's natural *Bromine* supply is held in the reservoir of the ocean. The Dead Sea concentration of bromine is 100 times that of the oceans. The supply is alleged to be the underground hotsprings which discharge into the bottom of the Sea of Galilee and from there, via the River Jordan, enters the Dead Sea. The source of bromine in the hot springs may be from the vast deposit of snails laid down by the sea of a distant era, in a buried stratum. An early bromine derivative, tyrian purple, was made by the Phoenicians from the purple snail *Murex*.

Within recent years much attention has been given to the possibilities of commercial extraction of some of the major constituents. Magnesium is now being removed from sea water on a large scale by precipitating magnesium oxide when an alkali is added.

Potassium, a major constituent, an invaluable substance as a fertilizer, has resisted large scale production methods. However, when the secret of marine plant conversion is known, this substance of an inexhaustible store will be tapped. (Cox, 1959).

Salt itself one of our constantly required dietary items, is a product that is harvested in salt beds all over the world in hot and dry regions. Natural deposits in salt basins, the fossil salt water deserts of the evaporated inland seas, was the origin.

Seaweed products present an interesting side light and we note a utilitarian aspect of a constituent of that sea plant. The substance, algin, has been used for water proofing concrete, fire proofing wood, preventing scale formation in ships' boilers and for boiler insulation. It has the power to bind powders which do not easily stick together and it is entirely odourless, colourless and tasteless. Medically it is used for preventing bleeding during operations, and special surgical gauzes can be left inside a body to be absorbed. Agar agar, another jelly like material extract from seaweed, has been used as a food for many hundreds of years in the East. A close relative of agar-agar, Irish Moss, is widely used in the food industry, like algin, as a substitute for pectin in jams and gelatine in meat pies.

Oil, that extremely precious commodity of our day, had its origin probably at the beginning of the Paleozoic period when the bodies of plants and animals became buried under the fine grained sediments of former seas and was there subjected to slow decomposition, assisted now and again by the advance and retreat of the seas

over the contine[illegible] ernst

The great oil indu[illegible] Gulf of Mexico are asso[illegible] place of shrinking seas when the earth became hot and dry and that kept [illegible] laid down with it formed this oil In time as great pressures developed the s[illegible] were pushed up above the oil deposits like vast relief valve domes and now pr[illegible] pectors extend their operations from the land oil basins to the precious beds [illegible] present sea where the ancient seas gave them birth

Modern devices used by marine geologists to detect oil deposits include a gra[illegible] meter This electronic device when placed on the sea floor records the gravi[illegible] attraction of the earth at that site Where readings show a difference from the know[illegible] attraction of that latitude there is an indication that it may be caused by an oil bearing cavity

Another fairly reliable means of discovering these oil fields is linked to the knowledge that this oil was first formed in the Eocene period in the limestone deposits of 75 45 million years ago That epoch was characterized by the development of limestone depositing Nummulites the small single-celled animal which existed in enormous numbers then and whose remains formed the crests of the Swiss Alps Thus information of evidence of life or sediments that existed in that period serves as a clue to oil deposits in the stratigraphic traps which formed Drop-coring has become a method of sea floor sampling to hunt for these clues (Dugan 1960)

It is a truly remarkable story of well designed natural economy with time no object

Ocean Floor Component Studies

The study of the geochronology of deep ocean sediments has been directed to solution of problems by three methods

(a) Analysis of composition of foraminifera deposits
(b) Measurement of radioactive elements of the different sediment layers
(c) Analysis in selected areas of volcanic ash layers

Radioactive contents of materials of ancient origin is the accurate means of dating geological deposits The earliest determination of the abyssal sediments red clay and radiolarian ooze showed a relatively high radium content

Joly of Dublin using the unitary of the twelfth decimal place or one million millionth part of the weight, examined the *Challenger* samples of red clay and reckoned them to contain 40 such noted units

This measure is 50 times that of the average units found in continental sedimentary rocks His explanation for the presence of this deep sea bed radium was that it derived from a chemical precipitation of radium sulphate by the element acting on ocean waters or that the radium came from break down of the high concentration of uranium of the abyssal depths

After several more years of investigation the answer to the question of radium origin became somewhat clearer It was established that although the sea water radium content was sparse there was a larger and constant amount of dissolved uranium stated to be 1.3×10^{-6} gramme of uranium per litre of sea water of normal salinity This difference then between sea water scarcity and sediment deposit

abundance was linked to IONIUM an intermediate substance between the uranium and radium link This substance the immediate precursor of radium is believed to be removed in solution from sea water as a ferrous precipitate It was then conjectured that the disintegration of the precipitated ionium gave rise to radium This age determinations could be made in the deposits as the two elements settled into an equilibrium ratio with the disintegration of the longer lived basis IONIUM

Even under the most favourable circumstances of undisturbed sedimentation and ionium precipitation at a constant rate, the time span by this method of age determination is limited to 300 000 400 000 years Beyond that the residual radium ionium content is too meagre for accurate radium determination However favourable conditions are seldom the case for lengthy periods and so general interpretations of findings become very limited

Radium measurements of cores by the standard radon determination of samples from the mid-Pacific red clay or radiolarian oozes noted by Kroll in 1953 did not show the simple exponential curve falling off downward below the near surface maximum as expected Further work led to the conclusion that a radioactive equilibrium between radium and ionium presents in the maxima of the sodium curves except in the uppermost surface layer where there is an excess of ionium It was then clear that the radium maxima near the deposit surface could not be 'uranium supported as the radium concentration of 50 units (50 × 10 $^{-6}$ G Ra/G sediment) would require an uranium concentration three million times greater (150 × 10 ^{6}G U/G sediment)

Another method the ultra violet fluorescence as a means of measuring uranium in sea water is also satisfactory However when sediment samples are analysed by this method the contained elements like magnesium and manganese can be difficult to separate from uranium and might interfere with readings

The photographic method of direct measurements of ionium in sediment samples shows that ionium supported radium in the upper levels of a core is of the same order as the quantity of potential radium expected from the disintegration of the uranium present in the superposed column of sea water varying in a factor excess over that of sea water which has been hypothesised to be from the higher content of uranium and or ionium in the ocean water during the upper Pleistocene era

A possible explanation of the irregularity curve of radium distribution in cores in the central and western regions of the equatorial Pacific could be the result of increased submarine volcanic activity recorded earlier which intensified local increases of bottom currents leading to a horizontal transportation of sediments

Another means of radium removal from sea water and its concentration is linked with its affinity with manganese and absorption by manganese peroxide The well known manganese nodules found on the ocean floor demonstrates this feature when readings showed that the radium content present in the thin concentric layers of these manganese concretions falls off rapidly towards the core nucleus By this method it is possible to measure the chronological radial growth of a nodule

to summary then the rare radioactive elements in sea water because of precipitation are thorium and ionium The isotope ionium produced from dissolved uranium is continually being removed by precipitation from sea water to the sea floor where it

its descendant radium The concentration in the deposit decreases with ... with increasing depth below the sediment surface—and this is not ... under disturbed conditions of this sedimentation

There is a fairly constant uranium content in sea water It is present in sediments in amount of a few units of the sixth decimal place of a gramme per gramme of sediment

The equilibrium value of uranium supported radium is of the order of the twelfth decimal place of G Ra G

The time span of age determinations however only cover a limited period of 300 000-400 000 years ago

The other radioactive elements which measure time periods include the radioactive isotope of carbon C^{14} arising from atmospheric CO_2 through nuclear collisions and deposited as carbonates on the ocean bed Such determinations are limited to less than 20 000 years as the half life of radioactive carbon is 5 568 years

(to be continued)

A PRELIMINARY TRIAL OF "CHYMORAL" GIVEN TO REDUCE POST-OPERATIVE SWELLING FOLLOWING SURGICAL REMOVAL OF WISDOM TEETH

By Surgeon Commander (D) E B MACKENZIE R N

PROTEOLYTIC enzyme therapy has already been reported to have an anti inflammatory action on the affected tissues following surgical trauma The post-operative œdema swelling and pain is reduced the circulation restored and so the process of healing is accelerated Streptokinase was used parenterally by intramuscular injection to control the post operative effects of surgical removal of teeth (Mackenzie 1959) The results were positive, though there were complaints of pain at the site of injection with some malaise and abdominal discomfort Later Varidase was introduced to the blood stream orally through the mucous membranes (Mackenzie 1960) The disadvantage of this second method of giving proteolytic enzyme therapy lay in the time taken for the tablet to dissolve in the buccal sulcus During this period when the drug was concentrated in the accumulating saliva and being absorbed the patient was warned not to swallow or the enzyme would be destroyed by the gastric juices There were also some complaints of mild gingivitis following this buccal therapy A new method of introducing the proteolytic enzyme has now been evolved which has none of the disadvantages of the previous methods The tablet Chymoral containing the enzyme is just swallowed and is intestinally absorbed The enzyme is thus made accessible to peripheral sites of pathology when orally administered

The anti inflammatory response of the tissues and the clinical improvement may be caused by a selective inhibition and/or resorption of œdema fluid without a similar interference in the transfer of white cells into the pathological site (Beck, 1960)

"Chymoral" was tried in patients who had to have wisdom teeth surgically removed The same operative technique was used under intratracheal anæsthesia extracting the teeth on one side first as control When the patient had completely recovered the opposite tooth was removed but this time Chymoral tablets were given The dose was two tablets every four hours the day before surgery and continued on recovery from the anæsthetic Three typical cases are reported

Case 1 This man had his lower unerupted impacted wisdom teeth removed The left side was treated first as control although for reasons remote from his dental condition he was being given Tetracycline 500 mg.m every six hours He was photographed 24 hours after operation (Fig 1) when trismus limited mouth opening to less than one finger "When he had completely recovered the tooth on the right side was removed under enzyme therapy The photograph (Fig 2) taken after 24 hours when Chymoral was given shows a swelling which compares favourably with the control side It was a soft swelling and according to the patient felt very much

better than in the other side. Figure 3 shows the lack of trismus here compared with the very small opening possible at 24 hours after the original operation. The Tetracycline had been discontinued seven days before the second operation. Resolution was rapid and practically painless when using "Chymoral". He was given 24 tablets in all.

Fig. 1

Fig. 2

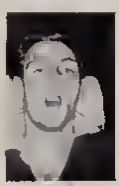

Fig. 3

Case 2. A young man had partly erupted and impacted lower wisdom teeth which had been giving pain. His upper third molars were erupted but non functional. The left teeth were removed first as control. Figure 4 shows the swelling 48 hours after operation when the patient felt "terrible" and was in pain. Trismus was less than "one finger" and the swelling tense and tender. A month later the right side wisdom teeth were removed using "Chymoral". The lower tooth was obstinate. Figure 5 shows the maximum post operative swelling again at 48 hours and Figure 6 shows the very satisfactory opening at that time. From then on there was a steady and rapid return to normality. He was given a total of 16 tablets of "Chymoral" but no antibiotics for either operation.

Fig. 4

Fig. 5

Fig. 6

Case 3. This man had bilateral deeply impacted wisdom teeth unerupted in bone. The teeth on the right side were removed as control under penicillin cover and the remaining left wisdom teeth taken out several weeks later using "Chymoral" but

initially no antibiotics The second operation was comparatively difficult and 72 hours post-operatively penicillin therapy was started Nevertheless Figure 7 taken 24 hours after operation using "Chymoral" shows maximum swelling after which there was a steady reduction in size and relaxation of trismus Without Chymoral the worst trismus was experienced at 48 hours after operation Figure 8 when there was also the most swelling After this peak he recovered very slowly Using "Chymoral" the patient was practically normal seven days after operation (Fig 9) He was given a total of 32 tablets The control was quite appreciably swollen 14 days after operation

Fig 7

Fig 8

Fig 9

It was clearly seen that the use of this safe and easy therapy to control expected post operative swelling and relax trismus is well worth further trial No toxic or side effects have been reported It is stated by the manufacturers (Armour Pharmaceutical Co Ltd) that though this enzyme does not interfere with normal clotting it should be used with caution in patients having abnormalities of the blood clotting mechanism as in severe liver disease

Summary

It was noticed that when using "Chymoral" the post operative swelling and trismus reached its maximum at 24 hours after which there was a steady and rapid recovery The swelling and trismus on the control side took 48 hours to reach its height when the face was tense and tender and resolution took a considerably longer time in comparison Using the drug trismus was slight and there was little pain or discomfort

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THE TREATMENT OF EUSTACHIAN CATARRH IN DIVING AND SUBMARINE PERSONNEL WITH "ESKORNADE"

By Surgeon Commander R. T. MAY, R.N. and
Surgeon Lieutenant W. M. HOLLYHOCK, R.N.

One of us has reported in a preliminary communication (May 1960) on the use of an oral nasal decongestant Eskornade in the treatment of eustachian catarrh in divers. We are now able to report on a further 64 men suffering from eustachian catarrh whilst under training for diving (22 men) and for free ascent submarine escape (42 men).

Essentially the situation facing an "escaper" is similar to that facing a diver both experience an increased ambient pressure followed by a decrease of pressure during the ascent to the surface. One difference arises however in the parameters of the escape situation the "escaper" has to face a more rapid rate of increase of pressure than does the diver and likewise a more rapid decompression the ascent normally taking place at six to seven feet per second. Also unlike the diver the "escaper" cannot influence his rate of decompression but must maintain his rate of ascent regardless of any aural symptoms. The situation facing the trainee diver has been previously reported (May 1960).

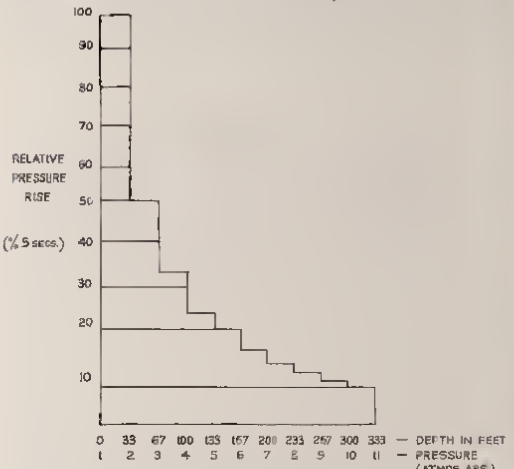
The depths used in training an escaper are from 100 feet maximum depth (i.e. four atmospheres absolute). In this respect it should be noted that it is at the shallow depth that the greatest relative pressure change takes place: thus the absolute pressure falls 50 per cent. from 33 feet to surface in about five seconds whereas it will only fall by 10 per cent. in the same time from 333 feet depth. (See diagram.) The point should also be made that the "escaper" unlike the diver compresses in air rather than water. He has to be prepared to expect large pressure changes over which he has no control as the flooding up in the compartment must be done quickly to avoid risk of narcosis or bends from nitrogen absorption.

The trainee diver has the advantage that if he is unable to adapt himself to pressure changes he can delay his descent or ascent. He may then come to the surface without necessarily incurring damage to his tympanic membranes.

In the case of the trainee escaper he must carry out practice free ascent runs from the depth of 100 feet in the escape tank—a three atmosphere change of pressure in 15-20 seconds. This usually does not present a problem with eustachian catarrh as the man will find that he is unable to clear his ears during the period of compression and thus can be removed without damage to his tympanic membranes. On the other hand men can have silent catarrh sinusitis and can develop severe symptoms during the ascent which were not apparent during the period of compression.

It is of course very undesirable for morale purposes to have to stop flooding and remove a man from the training compartment. Therefore every care should be

Idiagram to illustrate the decrement in percentage rise of absolute pressure during descent at a constant rate of 6·6 feet per second



NOTE.—As the tympanic membrane seals a chamber which may become isolated by catarrhal pathology it is the percentage of pressure differential which will determine the distortion of the membrane and hence the degree of trauma produced

taken to ensure that a man can immediately adapt to changes of pressure before entering the compartment

Candidates for the submarine service like the diving service must be clear of chronic oro nasal and sinus pathology which would make them unable to accept pressure change Apart from the escape risk, submariners have to accept pressure changes under normal sea going conditions When the submarine is submerged at cruising stations the air is supplied to the engines from the surface through the Schnorkel tube a hydrostatic valve is fitted in the Schnorkel which closes if the tube should unintentionally be submerged in a swell or rough weather At such times the pressure in the boat may fall as low as 21 inches of mercury for very brief periods although it would not normally be allowed to fall below 26 inches of mercury

Whatever method of diving or escape is used short of bringing survivors up in a

sealed capsule the pressure changes described above are inevitable The British Davis apparatus, the American Momsen lung the German Drueger equipment—all in standard use until recent times—provided the escaper with air or oxygen supply but free ascent has shown this supply to be superfluous The diver has however to be supplied with air oxygen or an oxygen combination from a bottle but whether a man gets his air from a bottle or from the expanding supply in his chest the E N T problems remain identical

It is in treatment of certain minor and short duration disturbances of the oro nasal tract that an oral-nasal decongestant is of value The condition may be trivial in itself and cause no disability in the normal individual but it may apart from service considerations cause a man who is eminently well suited in all other aspects to fail in the career he wishes to follow

Material

" Eskornade, an oral nasal decongestant was prescribed for the relief of eustachian catarrh in this series of cases

" Eskornade " is in " Spansule " capsule form and has the following constituents

(1) Phenylpropanolamine Hydrochloride 50 mg vasoconstrictor
(2) Isopropamide Iodide 2 5 mgs , an anticholinergic
(3) Diphenylpyraline 5 0 mgs an antihistaminic

Selection of Patients

The original 29 cases of divers suffering from eustachian catarrh due to allergic rhinorrhœa (reported previously) are not included in this series A further 21 divers with eustachian catarrh were treated during a comparable period in 1961 The 42 cases of " escapers " reported were treated during the winter of 1960 and the spring of 1961

Dosage and Management

One " Spansule " capsule was given twice daily to all cases

Divers

The first capsule was given at 0830 and the second at 1430 The management of each patient was as described in the preliminary report (May 1960)

Free Ascent

The first capsule was given at 0830 and the second some time between 1630 and bed time as convenient All trainee escapers who were unable to clear their ears in the morning before the practice ascent were examined Those with allergic rhinorrhœa were given Eskornade alone and permitted to make a free ascent the day they were able to clear their ears (usually on the second or third day of treatment) Those cases where infection was predominant were given inhalations or nasal drops and if no response occurred the drug was prescribed in addition A third group was given nasal drops or inhalations and Eskornade " at the same time The criterion of success or failure was deliberately made stringent and no case which did not obviously improve rapidly with the drug was included amongst those graded as " good "

Results

Divers

Of the 22 patients treated in this series 15 responded to treatment rapidly Two patients were able to dive but had to continue treatment as it was found that they were

unable to clear their eustachian tubes without Eskornade therapy Two patients responded to "Eskornade" but required either menthol inhalations or an ephedrine spray to clear their tubes completely Three men failed to respond two developed reversed ears and the third was sensitive to the rubber of the diving suit and was eliminated from the trial

Free Ascent

Of the 42 patients treated in this series eight responded rapidly to Eskornade alone and were able to carry out practice-free ascents within two days of commencing treatment Of the 34 patients treated with drops or inhalations and the drug as an adjunct 16 were able to make free ascents a further 16 failed to respond sufficiently to allow them to make a free run Two cases were transferred during the trial and were thus eliminated

Side Effects

Side effects were seen in three patients one man complained of a dry mouth and two of drowsiness

Discussion

The results of these two clinical impression trials have been combined in a single report as the basic problem of eustachian catarrh and its treatment is similar for both divers and escapers

The problem may be summarized as follows —

1 The need for elimination of candidates with obstructive pathology of the ears or sinuses when *and only when* this pathology is irreversible

2 The need for treatment within an economic space of time of patients on whom improvement can be confidently expected

3 The requirement that treatment should be simple and sufficiently thorough and effective to ensure that the diver or escaper can accept rapid pressure change unhesitatingly and safely

The approach to this problem is however not the same under operational conditions and under training conditions The approach under training conditions is that one cannot risk any exacerbation of existing disease due to an ill timed dive or ascent In diving this is unlikely as the man will develop pain in his ears and will be able to come immediately to the surface But in free ascent once in the tank the man is committed Although he can be removed from the compartment the speed of compression may have already damaged the ears Furthermore removal of one trainee may cause the safe time for the run to be exceeded so that other trainees are prevented from making the ascent It was for this reason that in certain cases where acute infection was predominant inhalations or nasal drops were given with "Eskornade" to ensure that the risk of exacerbating existing pathology was reduced to a minimum

Under normal service conditions divers must be available for immediate duty and as pointed out submarines are constantly subjected to pressure changes apart from the escape risk Although men in these services are known to be free of chronic disease of the ear and sinuses they are nevertheless subject to the usual acute and transitory conditions such as the common cold and vasomotor rhinorrhœa with the attendant risk of otic barotrauma with sudden pressure changes

Because of this barotrauma risk there is need for a simple and safe treatment for these conditions From the results reported in the preliminary paper by May (1960) and the results reported in this paper we are of the opinion that the oral nasal decongestant "Eskornade" meets this requirement It has been shown elsewhere to be effective in treating diseases of the nasal passages (O Connell and Reid Burrows and Sills in press) It appears to be particularly effective in cases of vasomotor rhinorrhœa and where the allergic symptoms often associated with a common cold predominate In cases where infection is present it is desirable to use in addition some local therapy such as inhalations or nasal drops By reducing the congestion Eskornade permits local therapy to reach the site of pathology which might otherwise be impossible

We are not suggesting that an oral nasal decongestant will cure the common cold or associated conditions but there is no doubt that Eskornade is most effective in the relief of the symptoms of these irksome diseases The three separate and distinct trials have shown that a considerable number of men with eustachian catarrh have been able to continue training who otherwise would have been excluded from duty This is of great importance when training has to be kept to a tight schedule and would of course be of vital importance under operational conditions

Conclusions

The results from this trial confirm the preliminary report that oral nasal decongestants have a valuable part in the treatment of the symptoms of anral otic and nasal congestion These results are also confirmed by the free ascent group but the figures in this group are not so convincing for as explained, it was desirable to use "Eskornade" in conjunction with local therapy

We have no doubt that Eskornade" is a safe and effective oral nasal decongestant We believe that it could be supplied to ships without medical officers for the use of divers and for men serving in submarines

The indiscriminate use of nasal decongestants of any kind is not recommended for divers suffering from Otorhinological disturbances unless medical advice has previously been sought

Summary

Sixty four shallow water divers and free ascent trainees in Service personnel were treated with an oral nasal decongestant, Eskornade

Forty six were able to accept relatively rapid compression and decompression without otic barotrauma and without loss of training time

Acknowledgment

We are indebted to Surgeon Captain W J Forbes Guild M D F R C S (Eng) Royal Navy for permission to publish the results of the submarine rating treated in H M S *Dolphin*

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COR PULMONALE—From "WHO Chronicle" May/June, 1961

OUR present information about the frequency of chronic pulmonary heart disease is sketchy and inadequate. The condition is not listed as such in the International Classification of Diseases but is allocated to the category of unspecified heart disease and what information we have is largely derived from statistics of hospital admissions and autopsies, different sources providing very different figures. Most workers agree, however, that over half the cases are the outcome of chronic bronchitis, asthma or emphysema. Cor pulmonale is a progressive and fatal disease, but its importance as a cause of chronic ill health has been insufficiently recognized. The recently published report[1] of a WHO Expert Committee on Chronic Cor Pulmonale points out that it is only lately that accurate physiological and clinical methods for its study and diagnosis have been worked out. If these can be generally applied and wide agreement reached on definitions and measurement, this will help in determining whether local variations in incidence are genuine and, if so, whether they reflect important social and environmental differences. It will aid further in the application of effective modern forms of treatment which may give sufferers years of useful life.

Definition and Classification

Cor pulmonale was defined by the Committee as "hypertrophy of the right ventricle resulting from diseases affecting the function and/or structure of the lung, except when these pulmonary alterations are the result of diseases that primarily affect the left side of the heart or of congenital heart disease." Such a pathological definition is preferable to one in terms of increased pulmonary vascular resistance which is notoriously variable and difficult to measure. The lung diseases responsible may be either those affecting respiratory function or those affecting the pulmonary blood vessels, the two groups differing in their clinical manifestations. In the first group the primary lung disease causes most of the symptoms, and cardiac involvement is secondary to respiratory failure; disturbances of respiratory function and of pulmonary vascular resistance coexist. In the second group symptoms are diverse and heart failure develops while respiratory function is still not much impaired; disturbance of vascular resistance in the lung fields predominates. The two groups may be broadly classified as follows:

1. *Diseases affecting respiratory function*

(a) Diseases of the air-passages and alveoli, chronic bronchitis, asthma and emphysema; pulmonary fibrosis including the pneumoconioses and other forms of occupational fibrosis; pulmonary granulomata and infiltrations such as sarcoidosis and parasitic disease.

(b) Diseases affecting thoracic movements: deformities such as kyphoscoliosis; the results of surgical procedures or of paralysis of respiratory muscles.

2. *Diseases of the pulmonary vessels*

These include primary diseases of the arterial wall—the various forms of arteritis

[1] Wld Hlth Org. techn. Rep. Ser. 1961, 213.

thromboembolic disorders and pressure on the main vessels by mediastinal tumours or fibrosis

Diagnosis

The recognition of cor pulmonale rests on clinical radiological electrocardiographic and haemodynamic evidence Basically it lies in demonstrating the existence of right ventricular hypertrophy in the presence of one of the causative diseases already mentioned yet such hypertrophy may not be easily appreciated in life even when autopsy reveals considerable changes in the ventricle The cardiac signs may be masked by distension of the overlying lung The radiological evidence is also inconstant, and enlargement of the ventricular shadow may indicate dilation rather than hypertrophy but it is common and typical to find the stem and main branches of the pulmonary artery dilated in contrast to the diminished vascular shadows at the periphery The electrocardiogram which sometimes remains persistently normal despite obvious pathological changes in the heart commonly exhibits groups of associated disturbances which are acceptable as highly suggestive or conclusive evidence Finally while the haemodynamic findings provide the most direct and accurate proof of pulmonary hypertension cardiac catheterization should be necessary in only few cases and should be performed only by competent workers under good conditions

Chronic bronchitis and emphysema

This group of disorders the most important numerically in aetiology is marked by alveolar hypoventilation Right ventricle hypertrophy is not a manifest feature as it is overlaid by the earlier and more obvious features in the lungs These diseases are characterized clinically by cough dyspnœa of effort, and wheezing The physical signs and radiological changes in the lungs are typical and easy to detect and the disturbances of respiratory function and gas interchange are demonstrable by spirometry and analysis of arterial gases In the natural history of this group there is a long introductory phase when there is no evidence of cardiac involvement but cough and expectoration appear as the main symptoms This is followed by a stage of breathlessness on exertion with or without intermittent respiratory infections these are sometimes severe and cause extreme cyanosis hypoxia and hypercapnia The final stage is one of congestive heart failure of sudden or insidious onset with dilation of the heart that eventually persists and with increasingly abnormal electrocardiographic findings In this type of heart failure the severe cyanosis, the polycythæmia and the disorientation and other neurological disturbances are in contrast to the features of right heart failure of rheumatic or ischæmic origin and the clinical recognition of cor pulmonale is made with much more certainty during this final phase The general picture is somewhat different in the other class of primary lung disorders responsible for cor pulmonale i e severe pulmonary fibrosis or granulomatosis Here there is a steadily progressive and disabling dyspnœa Many patients die without ever having developed cardiac failure at all and when this does occur it is not very responsive to treatment Finally hypoxia is not characteristic of the earlier stages here and hypercapnia rarely occurs

Cor pulmonale secondary to vascular disease

Here the essential underlying change is a widespread narrowing or actual occlusion

of the pulmonary vessels. There is an increased resistance to the blood flow and an increased load on the right heart. Right ventricular hypertrophy is early and manifest and its clinical recognition much easier than in other types of cor pulmonale because the cardiac signs are not obscured by changes in the overlying lungs. In severe pulmonary hypertension of this type, as may be seen for instance in occlusion due to bilharziasis—symptoms are usually absent for months or years until the onset of abrupt dyspnoea and syncope, even unconsciousness, on exertion. Cyanosis is not regularly present, the blood pressure is low and hypoxia is unusual. The radiological evidence of dilatation of the main pulmonary artery stem and branches is greater than in any other type of cor pulmonale, and patients do not necessarily develop any impairment of respiratory function. Similar patterns are seen in the other disorders included in this group of primary vascular diseases, such as multiple thrombotic or neoplastic embolism and vascular lesions forming part of a generalized disturbance such as polyarteritis or lupus erythematosus. Whether a condition of primary functional pulmonary hypertension without obvious anatomical changes exists at all as a genuine entity is still a matter of dispute.

Treatment

In many cases the treatment of the causative disease is already either well defined or acknowledged to be ineffective. The prompt antibiotic management of respiratory infections is essential to forestall the onset of cardiac failure. In the important group of cases due to chronic bronchitis the patient should stop smoking and avoid irritating climatic and industrial conditions of smoke or fog.

Prevention

Preventive measures in cor pulmonale include prevention of the primary disease where this is possible—as in tuberculosis, parasitic lung disease and the pneumoconioses—and measures designed to delay the development of the cardiac lesion. But the major preventive field is in connection with the chronic lung diseases, bronchitis, asthma, emphysema and bronchiectasis. In the industrialized countries of temperate zones the excess of mortality in middle aged men due to smoking and in large towns due to air pollution is well known. These two factors are of the greatest importance in initiating and aggravating the disease. In addition, the much higher death rate in unskilled workers of both sexes points to some other ill-defined domestic factor such as infection in over crowded, poorly-heated and badly ventilated rooms. Measures to limit cigarette smoking and to control air pollution are clearly advisable, but the first is not easy and our knowledge of the irritant components of the air of cities is still incomplete. Modern methods of heating and ventilation may reduce the risk of respiratory infection in the home, and in the workshop and factory it is important to suppress dust and other irritants and continue the search for hitherto unsuspected occupational hazards.

In preventing cardiac complications or forestalling cardiac failure rest is very important. Change to lighter work in the early stages of the disease is advisable, and prolonged rest is most valuable for any patient with chronic lung disease whose cardiac condition has begun to deteriorate. Anticoagulants are used whenever thrombosis plays an important part in aetiology, and venesection is sometimes indicated when there is polycythaemia and a raised blood volume.

"SKEFRON" FOR THE RELIEF OF PAIN

By Surgeon Commander B WESTON, R N

Doctor Janet Travell (1949) described the use of ethyl chloride spray for the treatment of acute wryneck and later urged its use in the treatment of painful muscle spasm (1952) Tavener (1960) reported the value of ethyl chloride spray in the relief of the pain associated with post herpetic lesions Ellis (1961) confirmed the value of ethyl chloride spray to relieve the pain associated with muscle spasm and also discussed the advantages of substituting a mixture of fluoromethanes for this purpose which was evolved by Dr W A Bain lately Professor of Pharmacology at Leeds University This fluoromethane mixture ("Skefron") is non toxic non-inflammable non-anaesthetic and is available in aerosol-type metal canisters

I have used this preparation in the Britannia Royal Naval College Dartmouth since February 1961 with considerable success The midshipmen and cadets under training lead an active physical life on the parade ground at boat work at practical leadership courses in the surrounding countryside and at all types of sport This activity is inevitably associated with a number of minor injuries with consequent severe disruption of their training courses Therefore a treatment for these conditions enabling a man to continue at duty can be of inestimable value

The technique of three five-second applications at half minute intervals with the can held at a distance of one to two feet from the skin was employed This was repeated three to four hours later as required the affected part was only rested when there was no immediate relief of pain

The results are shown in the table

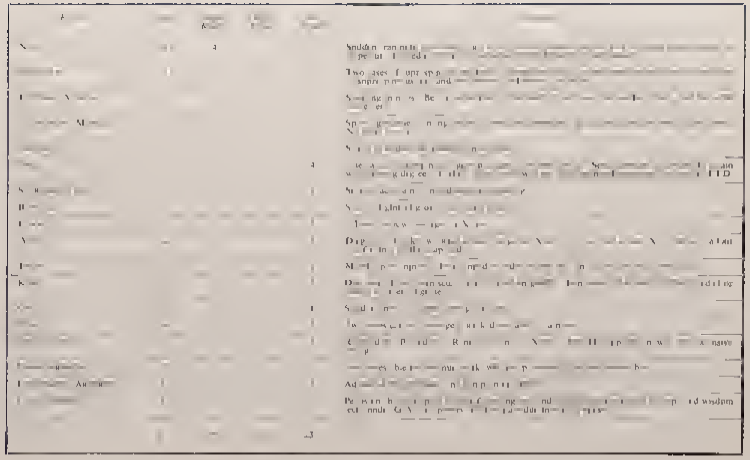
Three illustrative cases show the dramatic relief of symptoms that can be obtained

Case 1 Cadet aged 21 was brought to the Sick Bay from the assault course where he had strained his neck whilst swinging from a rope He was in great pain his head twisted to one side and a shoulder raised It was impossible to examine him properly He was given two sprays with "Skefron" with immediate and complete relief within a few minutes there was a return of full range of movement with neither pain nor tenderness The following day he played in and won an important tennis match

Case 2 A young officer playing tennis on a hard court developed sudden severe painful cramp of the right calf muscles There was immediate relief after application of Skefron A similar attack in similar circumstances a year before took four to five days to clear up

Case 3 A midshipman aged 20 years, sprained his left ankle whilst playing football The swelling and pain was such that the patient was unable to support his weight and resented examination An X ray showed no bony injury Skefron spray produced relief of pain allowing the easy application of strapping and an immediate ambulant patient

TABLE



The effects of Skefron Therapy on the relief of pain in 67 patients.

This short paper reports the results of treating [illegible] spasm with a new cold spray preparation Skefron The majority of the patients had sporting injuries In approximately a third of the patients there was a dramatic and complete relief of all symptoms In another third there was either partial or temporary relief of pain allowing the patient to be at work In the remaining third no improvement was noted

"Skefron" has been shown to be valuable in the treatment of minor injuries and one has only to see the face and hear the comments of wonderment of a cured case to be sure always to have on hand a supply of what is now called in the College "a squirt of Doc's cold stuff" It must be stressed however that "Skefron" must not be used on inflamed or broken skin

ACKNOWLEDGMENT

I am indebted to Surgeon Vice-Admiral W R S Panckridge C B Q H P Medical Director-General of the Navy for permission to publish this report and to Surgeon Lieutenant M Askew Royal Navy for his help in this work

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Clinical Notes and Cases

A CLINICO-PATHOLOGICAL PUZZLE

Surgeon Lieutenant-Commander W. B. WRIGHT, R.N.

THE case which will be described here was one of such considerable difficulty and led to so many mistaken assumptions that a correct diagnosis was never made in life in spite of intensive investigations in three hospitals. Because of this and because in retrospect it appears to represent a syndrome which might be recognisable by its features if ever seen again, I think it is worth while putting on record.

MALTA

(*First Week*) **C.L.G.**, a 28-year-old seaman serving on board a small ship, went ashore one night in the January of 1961 for a few pints of beer. He felt a little sick on the way back and turned in early. He woke in the middle of the night sweating and nauseated. He went to the heads to pass water and fainted there, falling to the deck. On recovering he dragged himself back to bed. He reported sick next morning and was admitted forthwith to R.N. Hospital, Bighi. The predominant clinical sign was pallor. The Surgeon Lieutenant who sent him in commented: — He looks like a chap who has had an intestinal bleed, but there is no history of any indigestion and he has been pale for some time.

There was nothing significant in his previous or family history. His only recent symptoms had been rather persistent headaches and a tendency to breathlessness when playing football, but it was also noted that he smoked 75 cigarettes daily.

Examination in hospital showed a pale flabby man with a tachycardia of 120 per minute. His temperature and blood pressure were normal, but blood examination revealed a severe normocytic anæmia with a Hb of only 45 per cent.

Provisional diagnosis was gastro-intestinal bleeding. He was given a slow two-pint blood transfusion forthwith and he felt a little better next day. The situation had become more complex, however, as a result of the following new findings:

(1) His temperature had risen to 102°F.

(2) Moist sounds appeared at the right base and he spat up some blood-stained sputum.

(3) The urine was loaded with albumin.

(4) His Hb was still only 50 per cent.

Urine microscopy showed little. The plasma proteins were low, but the blood urea was normal.

The provisional diagnosis was now that of a long-standing nephrosis with or without gastro-intestinal bleeding complicated by a right basal pneumonia.

The patient was given a course of penicillin and his temperature appeared to respond to this. A persistent abundance of albumin was found in the urine. No

[illegible] though they were consistently [illegible]

(*Second Week*) About the tenth day of his illness the man [illegible] had intense pain at the right loin which required urgent palliation for its relief. The pain spread into the right loin and there appeared to be some swelling. The white cell count rose from normal figures to 22 000 with 90 per cent Polymorphs. The patient appeared to be very ill.

Provisional diagnosis after some anxious consultation between physicians and surgeons was perinephric abscess. He was placed on the D.I.L. and the next day surgical exploration of the right kidney was undertaken. A lobulated kidney of normal size, colour and consistency was found. The pelvis of the ureter was quite flaccid. In view of these negative findings a laparotomy through a right upper paramedian incision was performed. A little distension of the small gut was found but there was no free fluid. Careful examination of the stomach duodenum, gall-bladder, pancreas, right kidney and spleen revealed no abnormality. The wounds were carefully closed and he was given another two pints of blood. (There was incidentally no evidence of incompatible transfusion at any time in spite of scrupulous enquiry.)

The next day all pain had left the patient and he felt much better but he was still spitting up blood and the urine was still loaded with albumin. He was put on a course of Chloramphenicol and breathing exercises.

(*Third Week*.) One week after his operation he complained of pain in the right calf and his leg was found to be swollen. Examination confirmed deep calf tenderness and a positive Homan's sign. Chest X-ray had revealed a consolidated area compatible with an infarction. It became apparent that a link-up between these findings was quite likely.

Provisional diagnosis was made of nephrosis complicated by deep venous thrombophlebitis and pulmonary embolism.

With care because of the recent operation, anticoagulant (Dindevan) therapy was commenced. After a week of this treatment the edematous swelling of the right leg appeared to be subsiding.

(*Fourth Week*.) The patient suddenly developed swelling of the left leg with symptoms suggestive of deep venous thrombosis of the calf and signs of thrombophlebitis in both arms. Hæmorrhages and exudates were now discovered in the fundi and it was observed that the blood pressure had risen to 150/90. It seemed impossible to equate these new findings with any of the previous diagnoses.

Provisional diagnosis of polyarteritis nodosa was made based on the following features:

1. Anæmia
2. Pneumonia and hæmoptysis
3. Nephrotic syndrome and hypertension
4. Thrombotic lesions
5. Retinal hæmorrhages and exudates

(*Fifth Week*.) The patient was started on prednisone and intracynlinn therapy and anticoagulants continued.

It was decided to transfer him to the United Kingdom for further investigation and treatment.

(*Sixth Week*) While the patient was awaiting transport [illegible] developed. Shortly afterwards he suffered a very severe paroxysm of [illegible] relieved morphine and physeptone for relief. It subsided [illegible]

R N Hospital, Haslar

(*Eighth Week*) The patient was seen to be pallid and puffy. There was a large ascitic effusion and painless œdema of legs and sacrum. There was no evidence of active thrombophlebitis and only retinal exudates were seen. The right lung base was dull to percussion and there was a suggestion of finger clubbing. The urine contained ten grammes of albumin per litre. An I V P did not outline either kidney though the bladder filled with contrast medium (i e there was no concentration on either side). Blood urea was 68 mgm per cent and the Total Plasma proteins were only 2·85 gm per cent. Blood investigations showed a severe normocytic anæmia and an active bone marrow.

(*Tenth Week*) In an attempt to confirm the diagnosis of polyarteritis nodosa the electrophoretic pattern was examined but this showed a hypogammaglobulinæmia. Pectoral muscle biopsy showed no evidence of polyarteritis. There was never any peripheral neuropathy.

(*Third Month*) A pattern of events began to unfold in which recurrent migratory phlebothrombosis of arms and legs would occur yet anticoagulants would cause melæna. All the while his legs were œdematous and his albuminuria persistent. Antibiotics steroids and diuretics were exhibited without a specific response being obtained. Transfusions corrected his anæmia only temporarily and his blood urea began to rise. The predominating features remained as follows:

1. Nephrosis
2. Anæmia
3. Migratory thrombophlebitis

(*Fourth Month*) There could be no certainty about the diagnosis. Possibilities entertained apart from polyarteritis nodosa were systemic Buerger's disease retroperitoneal neoplasm with renal vein or inferior vena caval thrombosis and symptomatic thrombophlebitis migrans.

The stepladder downward progress of the patient was relentless and it was decided to apply for a vacancy at St Mary's Hospital Paddington for further investigation.

St Mary's Hospital

(*Fifth Month*) On admission he was noted to have a markedly Cushingoid appearance and œdema of the lower half of the body. The blood pressure was 190/140. There were palpable thrombotic veins here and there in the arms. Consolidation was noted at the right base and chest X ray revealed a round shadow here with cavitation. The urine contained 5·17 grammes of protein per day and microscopy now showed red cells and granular casts—sometimes frank hæmaturia occurred.

(*Sixth Month*) Studies of plasma proteins revealed a peculiar electrophoretic pattern in which not only the albumin but the gamma-globulin was considerably reduced. The distribution and turnover of homologous albumin and gamma globulin

[illegible] rate of albumin synthesis well above the normal range [illegible] evident that the hypoalbuminuria resulted from [illegible] increased catabolism The rate of gamma globulin synthesis was normal

Hypogammaglobulinaemia in this patient was due mainly to a greatly increased rate of gamma globulin loss or breakdown (about five times the normal rate) These findings suggested that he had gastro intestinal lesions producing a leakage of plasma protein into the lumen of the bowel The association of these findings with gross proteinuria seemed to imply widespread endothelial damage

A provisional diagnosis of polyarteritis nodosa was made by the consultant physician

Final Course

Prednisone was continued to a dosage of 15 mgm t d s and he was given spironolactone up to 600 mgm daily and hydrochlorothiazide and Mersalyl on alternate days His recurrent thromhophlebitis continued and intermittently he was treated with Dindevan but occasionally had both gross melena and gross haematuria requiring several blood transfusions His ascites hardly varied His sudden deterioration began on 27th July 1961 when he showed signs of early cellulitis in the left groin which spread to involve the left leg and the lower part of the left side of the trunk. This was treated with Erythromycin but his condition steadily worsened and he developed small subcutaneous haemorrhages along the borders of the eyelids He became disorientated with much twitching and a flapping tremor which intravenous calcium did not relieve

He died on the 4th of August in the clinical state of uraemia

Post Mortem

The following findings were reported

1 Gross Left Ventricular hypertrophy (the myocardium and coronary arteries were healthy)

2 Terminal inhalation pneumonia at both bases At the base of the right lung there was a small infarct containing a necrotic cavity

3 The liver was enlarged and the capsule tense The lobular pattern on section was indistinct

4 The pancreas was normal

5 Both kidneys were large and white There was no sign of infarction Microscopic examination of the kidneys showed thickening of the basement membrane diffusely throughout the glomeruli with some hyalinization of the arterioles The findings were typically those seen in Ellis Type II Nephritis

6 The small intestine was oedematous

There were no other abnormal findings In particular there was no evidence whatever of any Collagen disease

Discussion

It will be noted that apart from the thrombotic lesions and the infarction all the post mortem findings were consistent with Ellis Type II Nephritis—"the large pale

him with the large pale kidneys Yet there were so many unusual features that this diagnosis seemed clinically unacceptable when he was alive

What then are the features of the syndrome from which this man died The picture is as follows

1 Profound anaemia

2 Ellis Type II Nephritis leading to kidney failure

3 Thrombophlebitis migrans

4 Hypogammaglobulinaemia

At first sight these would seem to have little connection with each other and indeed actually On reflection however this is not necessarily so

Severe anaemia as the presenting feature of chronic nephritis is a well established phenomenon French (1936) is worth quoting in this respect It happens not infrequently that a young patient suffering from chronic nephritis comes under observation for shortness of breath palpitations anaemia without ever having had any symptoms of acute nephritis at all The kidneys that would be found in such cases differ from the granular contracted kidneys of older people in that they are pale instead of red In this respect it may be recollected that the patient was short of breath on exertion and on first admission was described as a pale flabby man

The retinal changes are compatible with nephrosis proceeding to kidney failure

Hypogammaglobulinaemia was thought to be due to a leakage of plasma protein into the bowel The post-mortem showed no evidence of this However since the marked hypoalbuminaemia was manifestly due to a leakage of plasma protein through the kidneys it is hard to imagine that the kidney was not also responsible in some way for this gamma globulin loss This is the reasonable assumption

The only unrelated feature therefore is the thrombophlebitis migrans Usually this condition appears as a clinical entity without associated disease, but in a small proportion of cases (Barker 1936) carcinoma is involved usually visceral and most commonly in the body of the pancreas (Celbaum 1953) Polycythaemia vera leukaemia and other reticuloses can also induce the condition as an associated phenomenon as can the Collagen diseases (Miller and Daley 1946)

Its occurrence in conjunction with nephrosis has not been previously described to my knowledge In some ways this is surprising considering the changes in blood vessels and tissue fluids which result from renal disturbances (e g anaemia pericarditis and retinitis)

That the man s nephrosis was unusual is evidenced by the steady relentless six month downhill course, the severe unremittent anaemia and the odd blood electrophoretic pattern

It was also unusual in its association with thrombophlebitis migrans which was so much part and parcel of the illness that one felt that the two conditions must represent one syndrome in the same way as lung purpura and Henoch s purpura are linked with renal disease We have evidence that the plasma proteins were disturbed in a peculiar way It is only a short step to propose that either the fibrinolysin or the coagulation systems were affected in whatever particular way would produce thrombotic lesions The exact mechanism is of course unknown (Gillam 1961) It would not be an

unreasonable conclusion that the association of migratory thrombophlebitis with nephrosis is of extremely bad prognostic import and therefore memorable in this respect

ACKNOWLEDGMENT

I wish to thank Surgeon Rear Admiral D Steele-Perkins C I O F R C S (Eng) F R A C S *Q H S* for permission to publish this article

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Reviews

[illegible] —Report of the [illegible]. Edited by [illegible]. [illegible] charts and illustrations. London: Harvey & Hythe. [illegible]

[illegible] Royal Society of Medicine in November 1960. [illegible] distil the experiences of a group of men and women who [illegible] their own. In a search for answers to the following questions:

[illegible] does effective oral anticoagulant therapy improve expectation of [illegible] complications?

[illegible] therapy and what level and duration of treatment gives [illegible] with safety?

[illegible] succeeded so well as to make this book imperative reading for all [illegible] who have anything to do with anticoagulant therapy. This [illegible] new discovery or speculation. It is a sound appraisal of [illegible] experience.

The [illegible] text book here, but for me the fundamentals are better approached [illegible] in more formal pattern. Here each author [illegible] as he produces his chapter. He cannot fill in vague [illegible] at the discussion.

It [illegible] discussion discuss one reads like flippancy in the book [illegible] people [illegible] makes the contestants recognizable human beings and [illegible] conclusions. The questions raised never fail to draw meaning [illegible] on the first reading.

Apart [illegible] therapeutic indications of anti-coagulants and [illegible] highlighted two very important subjects:

1. The [illegible] facilities available in this country with the [illegible]

2. The [illegible] control.

The [illegible] I was alarming to read of so much [illegible] of its years of usefulness. Some authorities [illegible] notwithstanding the implications [illegible] to know about this trend.

[illegible] book is certainly worth the money to interested [illegible]

W. D. W.

[illegible] Pocket Medical Di[ctionary] [illegible] SRN RSCN STD (Lond.) [illegible] Edition. Pp. 492. [illegible] E. & S. Livingstone. Price 8s 6d, 9d Postage.

This popular nurses' reference [illegible] thoroughly revised and brought up to date. [illegible] in general [illegible] terms have been added. A new style [illegible] including the [illegible] where appropriate.

Much [illegible] information is [illegible] including a chapter on urine testing, also [illegible] list of diseases [illegible] and diagnostic signs designated by [illegible] those who discovered or [illegible] them.

The dictionary is a mine of information [illegible] the student nurse and will be equally popular [illegible] It is small enough [illegible] the pocket or handbag.

M. E. M.

Bacteriology and Immunity for Nurses. By Ronald Hare, M.D. Pp. viii + 193 with black and white illustrations and line drawings. London: Longmans. Price 17s.

This [illegible] practical textbook can be recommended for use by senior student nurses preparing for the State Final Examination. It will also be of value to trained nurses taking post registration courses.

The book [illegible] emphasis being on what micro-organisms do rather than what they are. The chapters dealing with Sources and Modes of Infection and Prevention of Infection by Sterilization Procedures are of especial value to student nurses. Full stress is given to the dangers of cross infection in hospital, these pages being adequately illustrated by line drawings. The photographic plates would perhaps be more helpful if sited alongside the relevant pages.

There is a useful table of chemotherapeutic compounds used in the treatment of diseases due to

micro-organisms. The section dealing with organ [illegible] and clearly presented though essentially brief in a book [illegible].
The volume is comprehensive and should be of value [illegible].

M. L. M.

Some Aspects of Obliterative Vascular Disease of the Lower Limb. By J. A. [illegible], M.D., Ch.M., F.R.C.S., and D. M. Douglas, Ch.M., F.R.C.S. Pp. [illegible]. Many black and white illustrations and line drawings. Edinburgh and London: E. & S. Livingstone. Price [illegible]. Home Postage [illegible].

Surgery has extended its scope to many parts of the body dealing with pathology hitherto considered untreatable by the healing knife.

Obliterative disease of the vascular tree is one such disease where arterial surgery has considerably improved the prognosis of those afflicted in the lower limb.

It is a specialized branch of surgery and therefore textbooks touch only briefly on the surgical physiology and techniques concerned in arterial surgery.

In order to improve one's knowledge of this specialized branch of surgery, reference to large monographs on the subject must be made, and there is little at the moment in the form of smaller adequate books on the subject to acquaint one more fully.

Thus it is that this book fills the gap admirably. It is well written [illegible] with large graphs and diagrams. There are included also easily interpreted black and white photographs.

The book discusses the pathology and clinical features of the [illegible] of the lower limb and this is followed by a chapter on special methods of investigation.

The chapters on the effects of chronic arterial obstruction and the use of vasodilator drugs are particularly well written.

Almost half of the book content is devoted to lumbar sympathectomy. The anatomy of the sympathetic chain, operative technique, physiological effects and clinical effects are fully discussed.

Unfortunately there is only one chapter on direct arterial surgery, but this is excellent and so quickly persuades one of the fact that here the best possible results will be obtained.

Many results from recognized authorities are quoted throughout the book so that the biased opinions of the authors do not constantly permeate the writing.

There is no doubt that this book fills a long felt need and will be especially rewarding to general surgeons without wide experience in this field as well as to general practitioners in their advising and sorting of those patients suffering from intermittent claudication who represent a considerable percentage of their practice.

A. H. T.

Textbook of Medical Treatment. Edited by Sir Derrick Dunlop, Sir Stanley Davidson and S. Alstead. Eighth Edition. Pp. xii + 983. There are a few black and white photographs. London and Edinburgh: E. & S. Livingstone Ltd. Price 60s. Home Postage 2s. 9d.

It is a pleasure to review such an excellent textbook as this, wherein each author has set out to produce a work of reference for doctors which will be practical and to the point. Presented with a case, say, of pleural effusion, the practitioner turning to this book will find exactly what he wants to know as regards its management and the latest advances in treatment to which it may be susceptible. The same applies to all the other sections of the book with the possible exception of that one devoted to psychiatry. Here I thought there was too much general principle and too little specific instruction, unless the authors meant that all but the mildest psychiatric disturbances should in practice be referred for specialist treatment. If so, this was certainly not in keeping with the message of the rest of the book.

This edition contains a great deal of new and revised material when compared with its predecessor. That it does so is perhaps a point against such a work, for it indicates how quickly and considerably it can be left behind by the sweep of new developments in the world of treatment. Each page is so filled with print that there is little marginal space for amendment. The doctor cannot therefore adjust his book to the march of events. Books devoted to diagnosis are much less susceptible to this kind of deterioration.

The hospital doctor and the ship's doctor will both reap benefit and satisfaction from having this book, as will the patients under their care. I consider that this work is not too heavy for the general practitioner, nor too light for the specialist, setting as it does a standard of accepted treatment in the light of which their own work can be modified.

I particularly liked the chapters on the care of old people, the chronic rheumatic diseases and disorders of electrolyte balance. The two new chapters on analgesics and diseases of the eye contain sound practical advice.

At 60s. this book is well worth the money to any proper doctor.

W. B. W.

Roxburgh's Common Skin Diseases. Revised by Peter Borrie, M.A., M.D. (Cantab.), F.R.C.P. (Lond.). Twelfth edition. Pp. xxiv + 504. 231 illustrations and eight coloured plates. London: H. K. Lewis & Co. Ltd. Price 50s.

This reviewer has always felt that, like so many other publications, "Roxburgh" was hardly the ideal textbook on dermatology, being too comprehensive for students and general practitioners, and far too superficial for dermatologists. He therefore approached the revised edition in the hope that a

book [illegible] largely [illegible] considerably improved accordingly. He was disappointed [illegible]

A large number of treatments [illegible] hardly helped to put him in a sympathetic frame of mind [illegible] holme (no [illegible]) (p. 11) [illegible] (p. 131) and [illegible] (p. 7[illegible]) [illegible] (p. 425) appears as area of [illegible] in p. 48 (when [illegible] has gover[illegible]

This book is intended for general practitioners [illegible] information on basic dermatological problems. They do [illegible] about perhaps 100 of the 120 common skin conditions [illegible] they gain from the statement that "sycosis [illegible] and words should [illegible] the frambesiform syphilide which often occurs" (p. 47)? [illegible] agree that vaccines, toxoids and other measures of increasing resistance [illegible] have proved quite valueless and have been abandoned (p. 52). There are [illegible] with the treatment of scabies, including the use of sulphur ointment (which [illegible] the sick?) but gammexane (Lorexane) is omitted and the danger of Benzyl Benzoate [illegible] is not mentioned. The recommended treatment for genital warts is still 25 per cent [illegible] which carries in the reviewer's opinion far too much risk for a busy general practitioner [illegible]. In the important section on fungus infections, which has been extensively revised, one learns with surprise that tinea pedis is particularly common in the armed forces, but little attention is made to point out (a) that the common maceration of the toe clefts which does not readily respond to fungicides (topical or systemic) is probably basically an intertriginous reaction in which the fungus plays only a secondary role, (b) that [illegible] is quite as common as [illegible] and (c) fungicides if used repeatedly are liable to cause medicamentous reactions. Finally dermatologists north of the border will shudder at the section on seborrhoeic dermatitis where a number of quite unrelated entities are lumped together in traditional [illegible]

It is a pity that this dermatological "standard" has not been greatly simplified. There is, of course, a lot of good stuff in it and of the 239 plates (eight in colour) a number are excellent. No doubt there are many who will still buy it at its increased price and gain valuable help from it. But it could be so much better.

R. S.

We acknowledge with thanks receipt of the following publications

Abstracts of Papers of 57th Scientific Session of Japanese Society of Internal Medicine. Acta Medica et Biologica. Annales Medicinae Internae Fenniae. [illegible] Medicina Nuova. Annales of Tropical Medicine and Parasitology. British Medical Bulletin. British Medical Journal. B.S.I. News. Fukushima Journal of Medical Science. Guy's Hospital Gazette. Journal of the R.A.M.C. Journal of the R.N. Scientific Service. Le Medecin De Reserve. Medicina Fennica. Medical Digest. Medical Journal of Osaka University. Middlesex Hospital Journal. Military Medicine. Nash Review. Proceedings of the Staff Meetings of the Mayo Clinic. Revista Di Medicina Aeronautica E Spaziale. Revista De Instituto De Medicina Tropical De Sao Paulo. St. Mary's Hospital Gazette. The British Journal of Surgery. The Broad Way. The Gunma Journal of Medical Sciences. The Journal of the American Dental Association. The Journal of the Irish Medical Association. The Kurume Medical Journal. The Kumamoto Medical Journal. The Medical Press. The Nuffield Foundation 16th Report. The Ulster Medical Journal. Tropical Diseases Bulletin. World Health Organisation Chronicle. Tonga Acta Medica.

News of the Service

WITH THE SIXTH FLEET IN THE MEDITERRANEAN

At [illegible] 25 [illegible] Vice Admiral David L. McDonald, U.S. Navy (right) greets [illegible] Surgeon Rear Admiral W. V. Beach, Royal Navy, and Mrs. Beach on board the [illegible] cruiser U.S.S. [illegible] (C.L.G. 7) at Malta. The two admirals last met in 1936. McDonald was then a [illegible] at Naval Air Station Pensacola, Florida. Beach was [illegible] goodwill visit to Pensacola on board the cruiser H.M.S. *Dragon*. Admiral McDonald now commands the United States Sixth Fleet. Admiral Beach is Medical Officer in Charge of the Royal Navy Hospital at Malta, as well as Medical Adviser to the Commander in Chief, Allied Forces, Mediterranean.

OBITUARY

Surgeon Rear Admiral Jonathan SHAND died on the 25th June 1961 at the age of 95 years.

Surgeon Rear Admiral Shand qualified M.B., M.Ch. and entered the Royal Naval Medical Service on 17th August 1887 as a Surgeon. He was promoted to Staff Surgeon on 17th August 1899 and Fleet Surgeon on 17th August 1903. On the 22nd April 1918 he was promoted Surgeon Captain and to Surgeon Rear Admiral on the 24th March 1920.

He was awarded the C.B.

Surgeon Rear Admiral Shand was placed on the Retired List (own request) on 2nd November 1923.

Surgeon Captain Kenelm Digby BELL died on 3rd July 1961. He was born on 13th June 1880.

Surgeon Captain Bell qualified M.R.C.S. (Eng.), L.R.C.P. (Eng.). He entered the Royal Naval Medical Service on 21st November 1904 as a Surgeon Lieutenant. He was promoted Surgeon Commander on the 12th December 1916 and was placed on the Retired List (Age) on 13th June 1930 with the rank of Surgeon Captain.

Surgeon Commander Harry SPICER died on the 13th August 1961. He was born on the 24th September 1869.

Surgeon Commander Spicer qualified as M.B., M.R.C.S., L.R.C.P. (Eng.) and entered the Royal Naval Medical Service on the 17th November 1894 as a Surgeon. He was promoted to Staff Surgeon on 14th November 1902 and Surgeon Commander on the 14th November 1910.

Surgeon Commander Spicer was placed on the Retired List (age) on the 1st January 1922.

Surgeon Captain J C Souter

D P G writes "I should like to add to the obituary notice of Surgeon Captain J C S[illegible] appeared in the Spring issue of the JOURNAL OF THE ROYAL NAVAL MEDICAL SERVICE as he was a man of such character and ability as to influence all junior medical officers with whom he came in contact.

At R N Hospital Malta during the years 1937 to 1940 Jimmy Souter was the Medical Specialist He was a young man in years but his white hair gave him a very dignified appearance He was a normal doctor In those days when medical conditions were often only open to treatment by heat and rest the personality of the physician was of immense importance and Souter had that knowledge of his subject and of human nature which inspired both confidence and affection He had a wonderful bedside manner and that most important attribute in clinical medicine—a soft and kindly speaking voice There were only six medical officers in Fight before the war to support the Medical Officer in Charge and Senior Medical Officer This meant that days on were very frequent and were enjoyed by all regardless of rank or seniority Souter was a tireless worker His knowledge of dermatology was exceptionally profound with an unusually accurate appreciation of the skin which one should stimulate and the one requiring sedation

His recruitment to the Medical Director General's Staff was a great loss to naval medicine and his exacting labours in control of medical stores during the initial years of the war greatly taxed his strength his work in this connection being happily recognised by two Allied Powers

Much sympathy will be felt for Mrs Souter and stepsons with whom his relationship was one of profound devotion.

Miss Mary FINNEGAN Superintending Sister died at the Royal Naval Hospital Haslar on Sunday 30th April 1961

H M writes "Although a patient at the time her sudden death was a shock to her relations and many friends in the Service

Miss Finnegan had been a member of Q A R N N S since November 1939 and will be remembered for her true kindness and gentleness to her patients and colleagues

HONOURS AND AWARDS

Promotions and Appointments to the Most Venerable Order of the Hospital of St John of Jerusalem

For Promotion to the Grade of Commander (Brother)

Surgeon Rear Admiral W V Beach, *O B E Q H S* F R C S (Ed)
Surgeon Rear Admiral J M Reese *Q H P Q H S*

For Promotion to the Grade of Officer (Brother)

Surgeon Captain E D Caldwell M D M R C P

For Admission to the Grade of Officer (Brother)

Surgeon Captain M H Adams M B F Ch D O M S

PROMOTIONS

Surgeon Lieutenant J K Ross M R F R C S to Surgeon Lieutenant-Commander

RE-ENTRY

Surgeon Lieutenant (D) J M Popplewell

RETIREMENTS

Surgeon Rear Admiral (D) W H Hillgate *O B E Q H D S* L D S on 20th November 1961 at his own request

RELEASED ON COMPLETION OF SHORT SERVICE COMMISSION

Surgeon Lieutenants F C T Cooper R W Richardson R R Pearson J R N Cart R W Turner A L Hinton R W K Nell J E Cox R S H Twidle P Connon M B Forster G M Paterson H Simpson J F Davidson H M Tuddenham P Johnson J R Nicholson
Surgeon Lieutenants (D) C F Wookey R Clark D Wilson

WARDMASTERS' OFFICERS

RETIREMENTS

Wardmaster Lieutenant-Commander W Jones *M B E* (Ag.)

QUEEN ALEXANDRA'S ROYAL NAVAL NURSING SERVICE

PROMOTIONS

To Matron—Miss A I Mitchell *A R R C* and Miss A E Brirman *A R R C*

RETIREMENTS

Miss M Potter Superintending Sister (Matron)
Miss L Latchford Superintending Sister (Medically Unfit).

ADMIRALTY FLEET ORDERS

(This page is perforated for filing purposes)

998 —Medical—Seasickness

1193 —Hospital Service Plan for Private Patients

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1304 —Medical—Term "Medical Confidential"

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Notice

THE EDITOR invites medical officers to send in original papers on professional subjects travel, personal experiences etc Items of news and matters of interest to the naval medical service will be welcomed from ships and establishments on home and foreign station Notices of births marriages and deaths are inserted free of charge to subscribers

All articles or communications published in the JOURNAL OF THE ROYAL NAVAL MEDICAL SERVICE will become the property of the Journal with full copyright powers unless the author declares when sending in the article that he desires to reserve the copyright to himself

The Harvard system should be employed for bibliographical references these references being arranged in alphabetical order of the authors names at the end of the contribution thus " Smith F G (1935) *J roy nav med Serv* **22,** 53 In the text a reference to a publication should be cited by giving the author and in brackets the date thus " Smith (1935) believed this to be due, etc ' or " lack of basis information on the strategic fundamentals of the science of the sea (Carson 1956) "

The Journal is published quarterly four numbers comprising one volume

Articles and communications may be sent to the Editor at any time **They should be clearly written or, preferably typed and sent in duplicate** to The Editor R N Medical School Alverstoke Hants

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For R N and R N V R medical personnel on the active or retired list and for Consultants to the Royal Navy the subscription is 20s per annum (postage included) payable on 1st January of each year Single copies 5s

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For all others who are *not* in the above categories the subscription is 24s per annum (postage included) or 6s per single copy

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THE EDITOR

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